S·A·E Journal

Published Monthly by The Society of Automotive Engineers, Inc.

A. T. Colwell, President — David Beecroft, Treasurer

John A. C. Warner, Secretary and General Manager

Norman G. Shidle, Executive Editor

About Authors

■ T. V. BUCKWALTER *(M '10), was made vice president of Timken Roller Bearing Co. in 1926 (his present position), after ten years with the company as chief engineer. When employed by the Pennsylvania Railroad as an electric machinist in 1900, he became gang leader in charge of electrification of belt-driven machine tools and construction of special electrically-driven machines. From there he was transferred to assistant, mechanical engineer's office, at Altoona, Pa., where he worked until 1916 and was then hired by Timken.*

■ H. H. ELLERBROCK, JR., *joined the NACA in 1930 and has been engaged in powerplant research work ever since. After graduating from Johns Hopkins University in 1927 with an M.E. degree, he was connected with the Bethlehem Steel Co. in mill maintenance work for a year and a half. He then worked in the chemistry laboratory of the Consolidated Gas, Electric Light, and Power Co. of Baltimore.*

■ JOHN T. FITZSIMMONS *(M '18) was first connected with the industry as a machinist helper at the Garford Co. in 1907. Upon graduating from the Case School of Applied Science with a B.S. in E.E. in 1911, he became a service representative for the Dayton Engineering Laboratories Co. After three years, he was transferred to the Engineering Department and has served in various units of General Motors Corp. in an engineering capacity ever since. He is now engineer in charge of ignition at the Delco-Remy Division.*

■ J. WILLARD LORD *(M '19) joined The Atlantic Refining Co. in 1934, working first in the Automotive Department, and then as safety engineer in the Safety & Fire Prevention Division of the Personnel Department. He is now with the same division in the Industrial Relations Department. Previous jobs were: motor assembler in the E. R. Thomas Shops in Buffalo; Captain, Motor Transport Corps, during World War I; general service manager with Pierce-Arrow; regional service manager in South America for General Motors Export.*

CONTENTS JANUARY 1942

SAE Standard Procedure Recommended for Testing Hardenability of Steel - 15

News of the Society - 21

SAE Annual Meeting and Engineering Display — Jan. 12-16 - 24

42 SAE Aircraft-Engine Standards Approved - 26

Victory Program's Impact on Defense - 28

TRANSACTIONS SECTION

Design Elements Affecting Safety — J. Willard Lord — 1

Cooling Characteristics of Submerged Light Aircraft Engines — H. H. Ellerbrock, Jr. — 7

The Ignition System as Influenced by Fuel Characteristics — J. T. Fitzsimmons — 15

Roller Bearings and National Defense — T. V. Buckwalter — 20

About SAE Members - 33

Applications Received - 37

New Members Qualified - 38

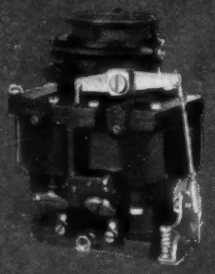
SAE Coming Events - 44

C. B. Whittelsey, Jr., Business Manager,
29 West 39th St., New York, N. Y.

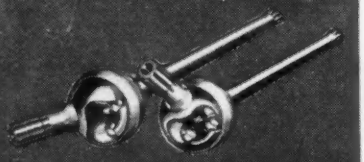
E. L. Carroll, Eastern Advertising Manager,
29 West 39th St., New York, N. Y.

A. J. Underwood, Western Advertising Manager,
2-136 General Motors Bldg., Detroit, Mich.

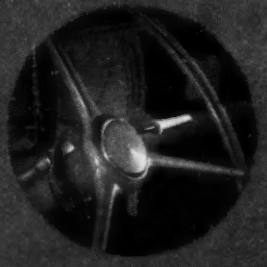
You, and we, must keep 'em rolling... and make 'em last!



Stromberg Carburetors, foremost in consistent, enduring, good performance.



Bendix-Weiss Constant-Velocity Universal Joints, an engineering triumph against vibration.



Bendix Finger-Tip Gear Shifting, pioneer and pacemaker of modern gear control.

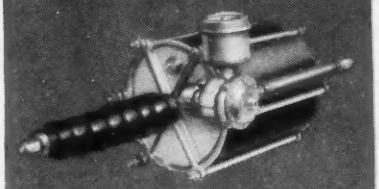
THIS automotive industry which we all serve has got its work cut out for it. Straight through, from every truck or automobile plant to every salesroom and repair shop, every service station, every distributor of renewal parts, every supplier of equipment, the one big, obvious task now and from now on is—

Keep 'em rolling . . . and make 'em last!

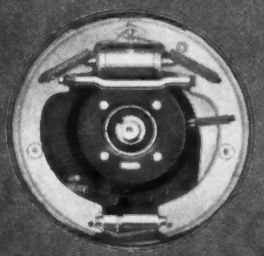
Every truck, car, bus, and tractor engaged in useful service is a precious fighting asset to America. Millions of our people must depend upon this life-sustaining flow of motor transport. Highway movement of food, clothing and munitions, as well as millions of vital daily journeys between home and shop, or office, or school, would soon slow down to an ox-cart pace if our industry overlooked its plain duty.

We *all* must serve . . . by providing, each of us, *our* part of this vast servicing program. In full compliance with government regulations, the Bendix replacement parts and supplies you need to keep motor vehicles at top efficiency and dependability, will be forthcoming—as faithfully, as promptly, as our most earnest efforts can provide.

BENDIX PRODUCTS DIVISION
of Bendix Aviation Corporation
South Bend, Indiana



Bendix B-K Vacuum Power Braking. World's favorite . . . constantly improved.



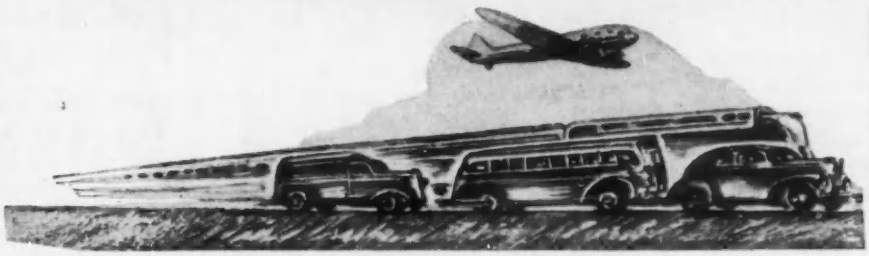
Bendix Brakes—hydraulic and mechanical—embody every vital braking advantage, including experience.

Bendix Factory-Lined Brake Shoes, packaged in sets for popular cars and trucks.

Bendix Products

SAE JOURNAL *Pre-Prints*

THE SOCIETY OF AUTOMOTIVE ENGINEERS, INC. 29 W. 39TH ST., NEW YORK



News of the **FEBRUARY** *Issue*

By Norman G. Shidle

What's Different?

WE are at war! What differences does that make for automotive engineers?

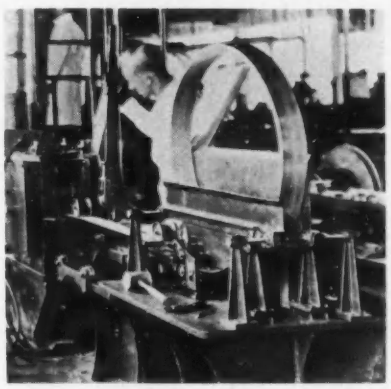
The need for their skills and efforts in defense product design and manufacture is intensified – obviously.

In addition, Washington conversations indicate, continuance of current work on redesign for reduction of critical material use in automotive products will continue to be welcomed. Even though civilian truck and passenger-car production seem likely to be eliminated soon – temporarily at least – there will still be need for the intensive work which car, truck, and tractor engineers have been carrying on in connection with alternate materials. Continued effort along this line, Washington sources indicate, will be important:

(1) For possible application to military vehicles as time goes on; (2) for most patriotic utilization of the remaining tons of material to be fabricated into civilian products; (3) to make possible production of a maximum number of replacement parts with a minimum of critical materials throughout the emergency; and (4) to be ready immediately with all the answers when, as, and if civilian car and truck output might be resumed to fill defense-backing civilian needs as a long war drags on.

. . . But the automotive engineers' direct contribution to the design and manufacture of mechanized might will clearly be his No. 1 function until peace through power is established again.

INDUSTRY'S PART IN WAR EFFORT 37th SAE ANNUAL MEETING THEME



In the mill (pictured above) a babbitt surface is being applied to a continuous steel strip. This mill typifies the highly specialized equipment used in the bearing industry today

THE terrific impact of all-out war on the far-flung automobile, aircraft, truck, and allied manufacturing industries and its manifold effects will keynote the 37th SAE Annual Meeting. The very automotive engineers and executives who have done such a magnificent job of defense preparedness and who are now responsible for assuring American victory through quantity and quality production of military equipment, will make the technical talks and lead the discussions.

This means a smashing February SAE Journal!

In page after page of this Annual Meeting issue, men of action will reveal their plans of action for ultimate victory . . . Aircraft, aircraft engines, diesel engines, ordnance vehicles, lubricants, automotive maintenance – these and many more subjects will be covered. The critical material situation will be analyzed in view of further supply shortages. Methods of accelerating experimentation, production, and improving engineering organization will be outlined.

All in the February SAE Journal!

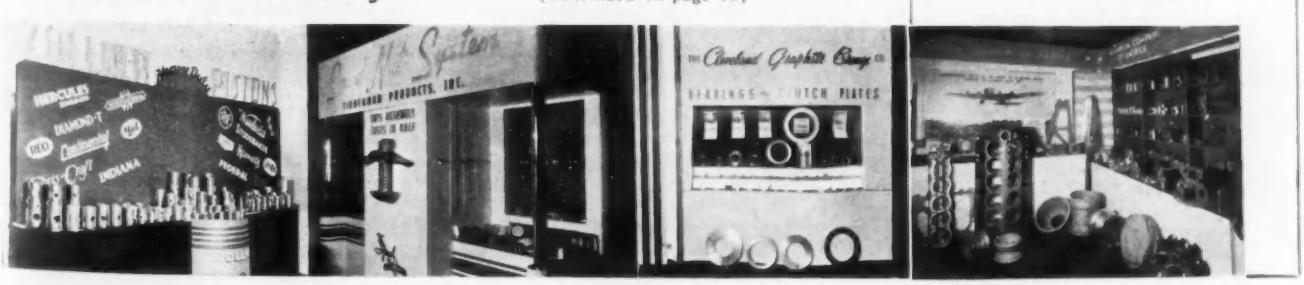
Tin Famine May Spur Use of Copper-Lead Bearings

A TREACHEROUS attack in mid-Pacific one quiet Sunday morning . . . and war bursts forth in the Eastern hemisphere.

With supply lines carrying tin from the war-torn East Indies, our major

(Concluded on page 10)

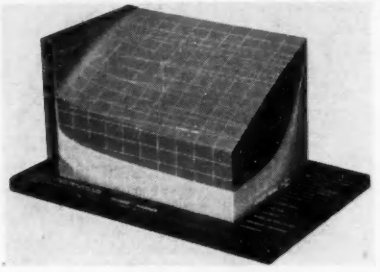
Dramatic engineering displays (below) advertising products widely used in the automotive industry are a regular feature of SAE Annual Meetings. This year manufacturers of automobile, aircraft, truck and allied industries will spotlight products which they are making for the defense of America



A Step Toward More Accurate Stress Determination

"EVERY engineer is taught how to solve for stress in loaded members and, after becoming reasonably proficient at stress problems, he is advised that it is a pretty good idea to assume that his answers are from 50 to 90% wrong."

This is the startling lead-off to an article in the February SAE Journal by J. O. Almen, of General Motors Research Laboratories, entitled: "Facts and Fallacies of Stress Determination."



This three-dimensional fatigue diagram shows graphically how fatigue failure of loaded members depends upon three variables – stress, stress cycles, and stress range

This is one reason why engineers building bridges or skyscrapers make structural parts heavier than necessary for safety's sake – to allow for deficiencies in calculation. That's O.K. in big operations where a few pounds or even tons extra here or there in a part don't make much difference. But in an airplane where weight must be kept to a minimum, and in an automobile where extra weight means extra cost, engineers have to figure to very close limits. The more accurately the stresses in loaded parts can be determined, the lighter the part can be made with safety.

Author Almen says: "In such machines (automobiles, aircraft, and so on), it is necessary that each unit of material shall do the maximum of work consistent with reasonable cost, and it is in the design of such machines that the inadequacy of our means of stress determination and our ignorance of fatigue strength of materials are most keenly felt."

He goes on to show what can and should be done to meet this vital problem.

Tin Famine May Spur Use of Copper-Lead Bearings

(*Concluded from page 9*)

source of supply, in serious danger of being cut, automotive bearing makers are faced with the possibility of a shut-off in their tin supplies. Although, with the exception of silver, every other commonly used automotive engine bearing material is under critical shortage – lead, copper, zinc, cadmium, antimony, and nickel – a serious tin famine would have the most far-reaching effects on bearing design. As a possible solution of the problem, copper-lead bearings have interesting possibilities, especially for heavy-duty service in trucks and buses where they already have come into use. Before any broader adoption of this type of bearing, prospective users should acquire an intimate knowledge of their possibilities and limitations.

In the February SAE Journal, Albert B. Willi, chief engineer, Federal-Mogul Corp., goes a long way to clarifying these possibilities, in an article entitled: "Bearings for Heavy-Duty Automotive Engines."

"Copper-lead bearings will do much more work than their tin-base counterparts," Mr. Willi says, "but they insist on doing it in their own way."

Temperamental? Yes. But, once engineers learn how properly to use these bearings, they will materially better the speed and striking power of our defense equipment.

How to Reduce Power Wasted in Tires

WHO would think that the tires on a medium-sized car would consume nearly 4 hp at 30 mph through rolling resistance? Or over 9 hp at 60 mph? Yet that's just what recent independent tire tests show. Not only the American motorist, but the U. S. Army, is paying in extra power loss and excessive gasoline consumption caused by unnecessary tire drag.

A group of tire engineers representing various companies has begun pooling test data on the rolling resistance of modern pneumatic tires in the interest of car economy. They've turned up with some very interesting facts.

Rim diameter, rim width, number of plies, inflation, load, road surface, traction . . . all affect power output, they find. With careful study of these factors, automotive engineers may be able to gain back some of that horsepower lost in rolling resistance.

The complete report of this tire group – printed in the February SAE Journal – will, we are sure, form a basis for extensive future research.

Watch for "The Rolling Resistance of Pneumatic Tires as a Factor in Car Economy."

Airlines, Unlike Saint Nick, Have Their Icing Problems

OLD Saint Nick is never bothered with icing trouble because his flying reindeers are much too warm-blooded to let ice form in their breathing apparatus. But not so Uncle Sam's flying transports.

Under severe icing conditions, in ships without adequate preventive means, the openings of carburetor intakes on passenger planes may become clogged with quick-forming ice crystals; the inflow of all-essential air is slowly choked off and, if the ice is not broken free, serious trouble, even disaster, may result.

Heat is the most commonly used ice-preventing means and seems the logical answer to this problem. But, to provide heat in the induction system sufficient to melt such tenacious ice formations involves engine power loss just at the time such power is vital.

Leo B. Kimball, of the National Bureau of Standards, says that the problem resolves itself into designing a "system in which no ice will accumulate under severe icing conditions, and which will require no heat, alcohol, anilol, or protected air intakes."

What is being done to devise this ideal system, what methods are being used for present protection against this menace to aircraft safety, are revealed by Mr. Kimball in a stirring February SAE Journal article. Read "Icing Problems in Aircraft Induction Systems."

SAE Standard Procedure Recommended for Testing HARDENABILITY of STEEL

• ***Developed by the Subdivision on Hardenability Tests,***

Iron and Steel Division, SAE Standards Committee

THE continually increasing use of hardenability testing for selecting steels for industrial applications creates a need for a standard procedure for hardenability testing and a standard system for denoting hardenability of steel. To meet this need the Iron & Steel Division of the SAE Standards Committee recommends the Jominy End-Quench Test as the standard method of testing hardenability and that hardenability be expressed in terms of distance from the quenched end to which a certain hardening occurs. For the purpose of predicting the hardening characteristics of steel in various-sized sections, the hardness data obtained from the end-quenched hardenability test bar is plotted versus cooling rates and compared with a chart showing cooling rates from surface to center of various-sized sections.

The procedure prescribed for conducting the hardenability test and for recording the results to conform with the SAE Recommended Practice is included in this article. Also included are standard charts for plotting hardenability test results and for predicting hardness U-curves in various-sized rounds.

For daily routine testing of the hardenability of successive heats of steel that are required to have hardenability within certain limits, it is sufficient to designate hardenability simply in terms of distance from the quenched end to which a certain hardness is obtained. This designation is also adequate for comparing steels of different compositions to see whether they have similar hardenability. Hardenability limits for specifying steel in this manner are obtained by measuring the hardenability of a steel that has been proved satisfactory for the use intended. The hardenability test may be used in this way as an empirical test and, if no other use of hardenability data were contemplated, there would be no need to know what cooling rates during quenching were responsible for the different hardnesses obtained along the hardenability test bar. A very important additional use of hardenability data, however, is the estimation or prediction of hardnesses obtainable with any steel in new machine parts not yet in production and not similar to any parts on which production experience is available. To make such a prediction or

[1] See SAE Transactions, July, 1941, pp. 266-276: "Use of Hardenability Tests for Selection and Specification of Automotive Steels," by A. L. Boegehold.

HARDENABILITY, the relative ability of a steel to harden under heat-treatment, has recently come into increasing use as one of the most important criteria for selecting or classifying steels for various industrial applications. As a result of this growing use, the need for a standard test procedure to permit correlation of hardenability test results among the laboratories of steel suppliers and consumers, is becoming steadily more urgent.

To fill this need, the Subdivision on Hardenability Tests of the Iron and Steel Division, SAE Standards Committee, has developed the proposed Standard Procedure for Hardenability Testing and the proposed Standard System for Denoting the Hardenability of Steel presented herewith, as SAE Recommended Practice. These recommendations are the fruits of more than two years' effort by the Subdivision.

Much of the material in the recommended standard procedure was obtained from the four-paper symposium: "Standardization Sought in Determining Hardenability of Steels," published on pp. 266-293, July, 1941, SAE Transactions, and presented at the 1941 Annual Meeting of the Society under the sponsorship of the Iron and Steel Division of the SAE Standards Committee.

estimate, it is necessary to know the cooling rates occurring in the part during quenching.

There are three methods of getting information as to what these cooling rates are:

A. They may be measured by thermocouples. This method is tedious and impractical.

B. They may be estimated by making the part of some steel, determining the hardness after quenching, and then substituting cooling rates for corresponding hardnesses from a hardness-cooling rate curve for the same steel obtained from a Jominy hardenability test.

C. They may be approximated by comparing the different sections of the part with round or plate sections of similar size on which cooling rates have been determined.

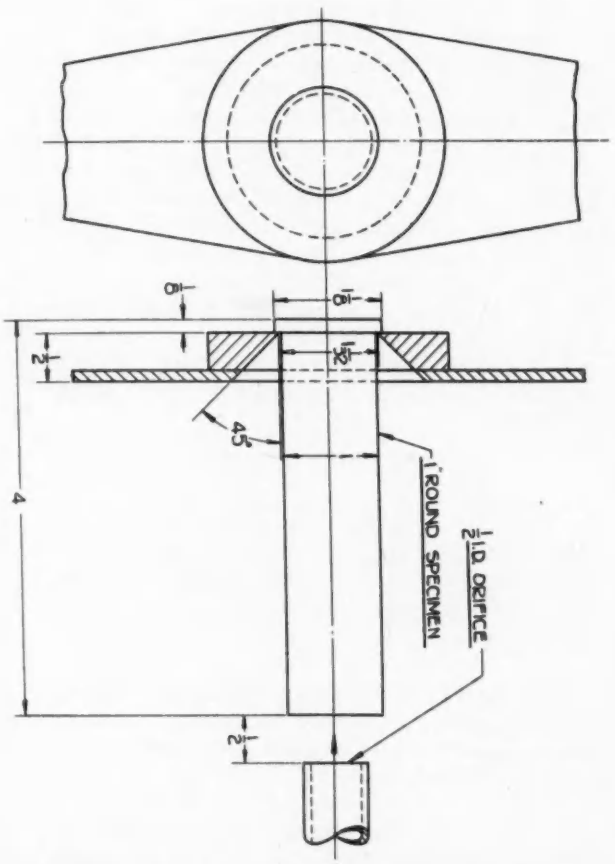
Method B is described at some length by Boegehold[1] in a previous article in the SAE Journal. This article also traces the steps in the selection of steel for a gear by means of an analysis of cooling rates in the gear and H-CR curves for steel.

Method B is sometimes referred to as the substitution of cooling rate for hardness method.

Method C is, in most cases, sufficiently accurate to provide enough information for deciding how much hardenability is required in a steel for the part in question.

As an aid in using Method C, the recommended procedure includes a chart showing cooling rates from surface to center of various-sized rounds quenched in oil and in water. Cooling rates on this chart are plotted to the same scale as the cooling rates on the chart for plotting the hardness results obtained from the Jominy hardenability test. By placing one chart above the other, the cooling rates may be traced from points on the hardness-cooling rate curve to points on the cooling rate versus distance below the surface curve, thus giving the hardness at various depths below the surface of various-sized rounds. These new data can then be used to construct hardness U-curves for each size round. The U-curves are then useful for indicating what hardness to expect in corresponding section sizes in the machine part under consideration.

Where quenching conditions to be used in production are other than those represented on the chart just mentioned, Method B may be used to determine cooling rates in a simple shape of appropriate section size to represent the section size of the machine part in question.



■ Fig. 1 – Test specimen in fixture for water quenching

Test Procedure

Hardenability of steel shall be determined by means of the end-quench or Jominy method. The test consists of water-quenching one end of a 1-in. diameter cylinder of the steel to be examined and measuring how far from the quenched end the steel hardens.

The details of the test specimens, test method, and designation of degree of hardenability are specified in Sections A to G:

A – The Test Specimen – The test specimen is essentially a 1-in. diameter cylinder 3 or 4 in. long with means for hanging it in a vertical position for end-quenching. Fig. 1 shows a test specimen in the fixture for water quenching, illustrating the preferred modification of the specimen.

Figs. 2, 3, and 4 give the details of the preferred specimen and two optional specimens.

Fig. 2 – 1-in. diameter x 4 in. long with 1¼-in. diameter x ⅛ in. thick flange at one end.

Fig. 3 – 1-in. diameter x 3 in. long with tapped hole in one end with a bolt screwed-in.

Fig. 4 – 1-in. diameter x 4 in. long used with a screwed-on ring for hanging in quench fixture.

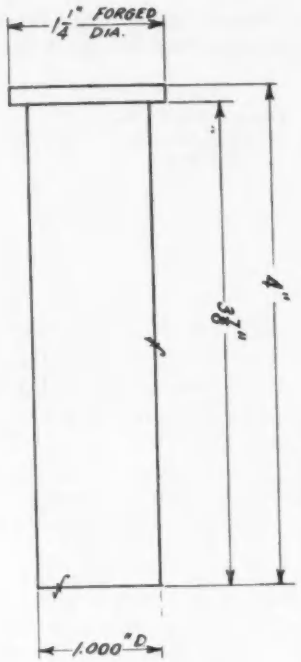
The bar from which the specimen is machined shall be large enough to permit removal of all decarburization.

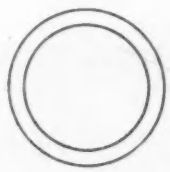
The foregoing specimens are suitable for determining hardenability of all steel with less hardening power than those that harden by air cooling in a ¾-in. round, excepting some shallow-hardening low-carbon and water-hardening tool steels. For these shallow hardening steels, other forms of specimens illustrated in Fig. 5 may be used to give more accurate results.

Note: The rate of cooling through 1300 F at varying distances from the water-quenched end of standard and Type-L specimens is shown in Fig. 6.

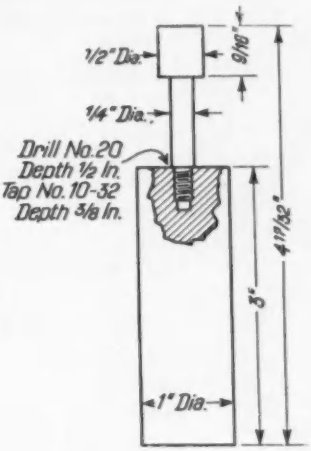
For determining hardenability on steel received in bars less than 1 in. in diameter, the test bar may be made ¾, ½ or ¼-in. diameter, as desired, and end-quenched as prescribed for the 1-in. round. Modifications in the water orifice are required for quenching cylinders of less than 1-in. diameter. The details of orifices for quenching specimens less than 1-in. diameter are given in Section D.

It is recommended that data from any one of these tests be reported wherever possible in terms of hardness versus

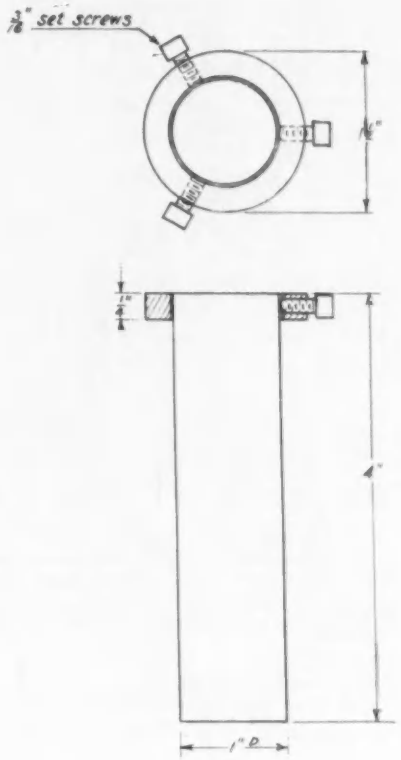




■ Fig. 2 – Preferred test specimen



■ Fig. 3. – Optional specimen



■ Fig. 4 – Optional specimen

cooling rate on the standard form provided for that purpose described in Section F.

Note: Due to the greater air-cooling effect on test bars less than 1 in. in diameter and especially in bars smaller than ¾ in. in diameter, the cooling rates at various distances from the quenched end will not be the same as in the standard test bar. Hardness curves from these smaller bars therefore are not comparable with curves from the standard 1-in. diameter specimen. If the standard hardness curve is needed, then the insertion method shown in Fig. 7 and described in the Appendix must be used.

B. Heating Prior to Heating for End Quenching – The steel from which the test specimen is made shall have been normalized. Any hardenability tests made under any other conditions are subject to agreement between the supplier and user. The record of the hardenability test results must always state the prior thermal history of the specimen tested.

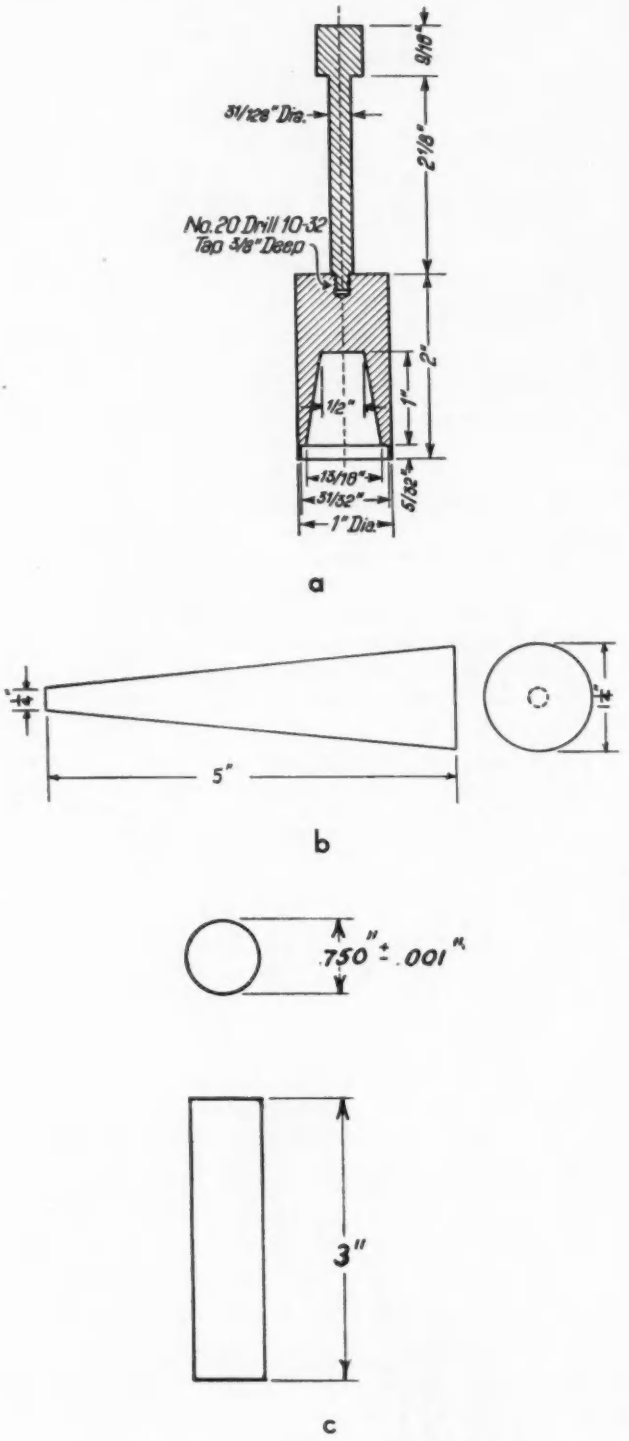
C. Heating for End Quenching – The specimen shall be heated to the proper hardening temperature for the steel under test in 30 to 40 min and held at that temperature for 30 min.

It is important that the environment of the test specimen while being subjected to heat is such that practically no scaling and little decarburization take place. This is especially true of the end to be quenched.

An adequately neutral atmosphere in the furnace is suitable for meeting the foregoing requirements. In the absence of properly controlled atmosphere, the specimen may be inserted in a suitable container and placed with the bottom end of the specimen resting on cast-iron chips. The container should have a cover to prevent circulation of scaling or decarburizing furnace gases in the container. When a container is used, it is necessary to determine by means of a thermocouple the time required for the test specimen to come to temperature to be sure that the foregoing heating time requirements are complied with.

D. Quenching – The test piece shall be placed on a fixture so that a column of water at 75 F ± 5 F may be directed against the bottom face of the piece. The column of water passing through an opening ½ in. in diameter shall rise to a free height of 2½ in. above the opening. The fixture shall be dry at the beginning of each test.

In performing the test, the water supply shall be shut off with a quick-opening valve, and the hot specimen placed over the water pipe so that the bottom of the specimen is ½ in. from the opening of the water pipe, and the water shall then be turned on. The sample shall remain on the fixture for at least 10 min. A condition of



■ Fig. 5 – Specimens for shallow-hardening steels

(a) – Type-L specimen (W. E. Jominy: "A Hardenability Test for Shallow-Hardening Steels," ASM Transactions, 1939, Vol. 27, pp. 1072-1085)

(b) – Conical specimen (O. V. Greene and C. B. Post: "Determination of Specific Hardenability of Shallow-Hardening Steels," SAE Transactions, July, 1941, pp. 278-283)

(c) – Shepherd P-F Test (B. F. Shepherd: "The P-F Characteristic of Steel," ASM Transactions, Vol. 22, 1934, p. 979)

still air shall be maintained around the piece during cooling.

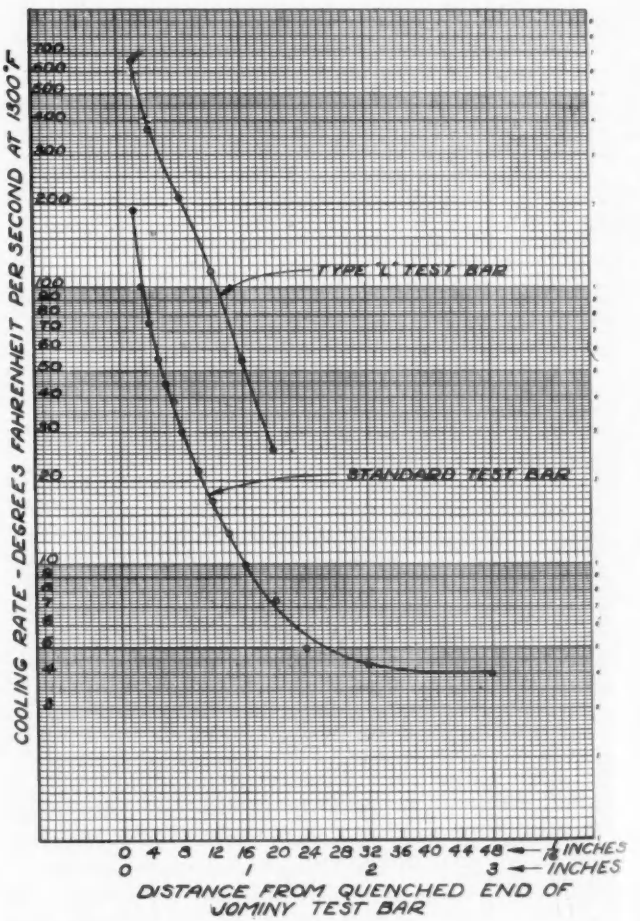
The orifice size and distance of specimen from the orifice for test bars smaller than 1-in. diameter are given in the following table:

Test Bar Diameter, In.	Orifice Size, In.	Distance from Orifice to Quenched End of Specimen, In.	Free Height of Water Column, In.
3/4	1/2	1/2	2 1/2
1/2	1/4	3/8	4
1/4	1/8	1/4	8

E. Hardness Measurement – Two flats 180 deg apart shall be ground 0.015 in. deep along the entire length of the bar and Rockwell hardness measurements made along the centerline of these flats. Care must be exercised in grinding to avoid tempering.

Readings shall be taken in steps of 1/16 in. Readings at identical distances shall be averaged for plotting. When a flat is used as a base, previous indentations shall be removed by grinding.

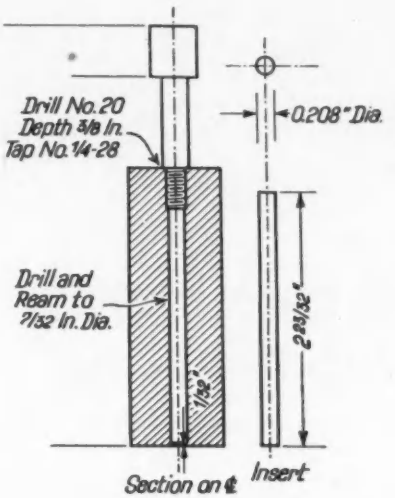
Note: A fixture for holding the sample while Rockwelling, which facilitates positioning the sample for each hardness test at 1/16-in. intervals, expedites the test and



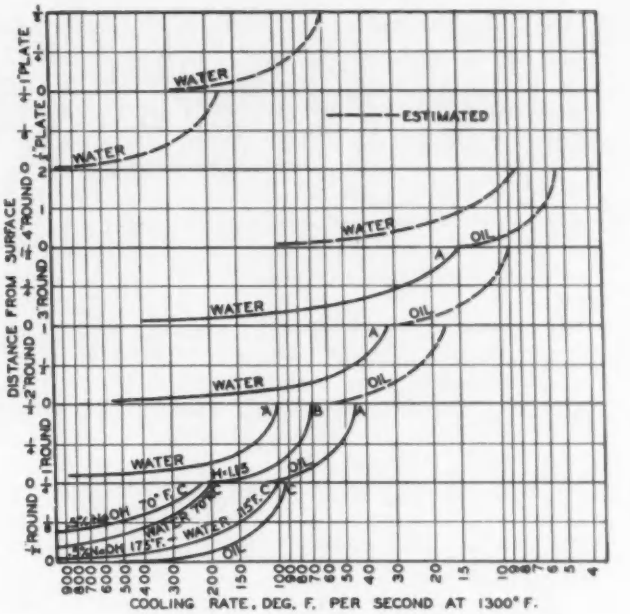
■ Fig. 6 – Cooling rates at different distances from the quenched end for the standard test bar and for the Type-L test bar

insures accuracy. Resting the sample in a V-block is not permitted.

F. Plotting of Tests – Tests should be plotted on a standard chart prepared for this purpose in which the ordinates represent hardness and the abscissae representing distance from the quenched end plotted with wide spacing per 1/16 in. at the quenched end, gradually decreasing to the other end. This type of plot provides a less steep curve for shallow-hardening steels and facilitates comparison of one curve with another.

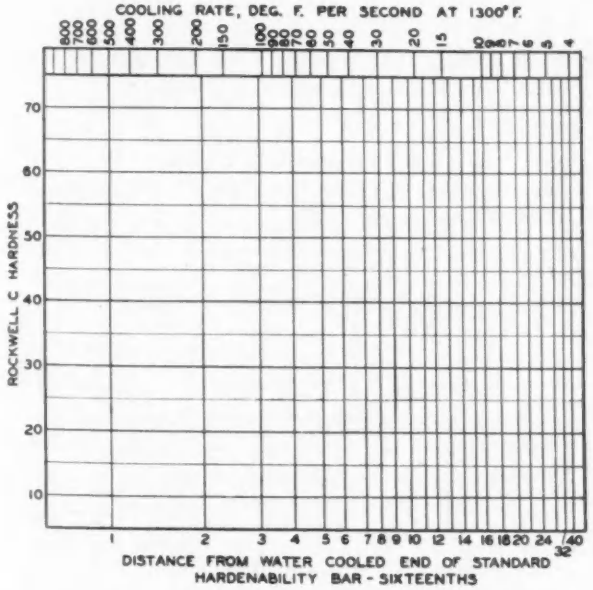


■ Fig. 7 – Drilled bar for steel available only in small sizes



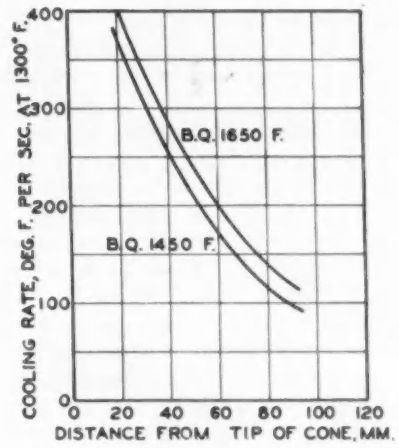
A – HOWARD SCOTT – TRANS. A.S.M. VOL. 22, 1934, P. 68-94.
B – ASIMOW, CRAIG, GROSSMAN – S.A.E. JOURNAL, VOL. 49, NO. 1.
C – FRENCH, HAMIL – TRANS. A.S.S.T. VOL. XVI, 1929, P. 711-739.
CENTER COOLING RATES OF ESTIMATED CURVES FROM FRENCH, THE QUENCHING OF STEELS, A.S.M. 1930, AND SCOTT.

■ Fig. 9 – Chart for using the hardness-cooling rate curve to predict hardness U-curves in various-size rounds when oil- or water-quenched


COOLING RATE, DEG. F. PER SECOND AT 1300° F.
ROCKWELL C HARDNESS
DISTANCE FROM WATER COOLED END OF STANDARD HARDENABILITY BAR - SIXTEENTHS

S.A.E. NO.	C	MN	P	S	SI	NI	CR	MO		QUENCH TEMP.	GRAIN SIZE	HEAT NO.

■ Fig. 8 – Standard form for plotting hardenability curves



■ Fig. 10 – Chart for preparing hardness-cooling rate curve from Greene and Post conical test bar

The spacing is derived from the scale of cooling rates appearing at the top of the chart. Expression of abscissa also in terms of cooling rates provides the means of making direct comparisons between steels tested with the standard end-quench test bar and those tested with other bars shown in Fig. 5. Fig. 8 shows the standard form for plotting hardenability curves.

A chart is also provided for using the hardness-cooling rate curve to predict hardness U-curves in various-size rounds when oil- or water-quenched. Fig. 9 shows this chart.

Fig. 10 is a chart to be used for preparing a hardness-cooling rate curve from data obtained from the conical test bar for shallow-hardening steels.

G. Index of Hardenability – The hardenability of a steel may be designated by a code indicating the distance from the quenched end in which hardness exceeds the hardness required for obtaining an acceptable quenched and drawn structure. For example, a steel with 0.35% carbon or more should be Rockwell C 50 upon quenching to yield a satisfactory structure after drawing.

A steel containing 0.25-0.35% carbon should be over Rockwell C 45 on quenching and a steel containing less than 0.25% carbon should be over Rockwell C 30.

The index expressed numerically for a steel that hardened above Rockwell C 50, out to 1½ in. (24 sixteenths) from the quenched end would be $J_{50} = 24$ (sixteenths).

One that hardened above Rockwell C 30 out to 5/16 in. from the quenched end would be designated by $J_{30} = 5$.

APPENDIX

Insert Test Bar for Testing Steel of Small Diameter – The insert test shown in Fig. 7 is used when a hardenability test is wanted on steel in sizes less than ¼ in. in diameter or when a hardness-cooling rate curve is desired for a steel available only in sizes less than 1-in. diameter. The cooling rates at various distances from the quenched end of test specimens less than 1 in. in diameter have not yet been determined but it can be stated that, due to the proportionate increase in the effect of air cooling as the diameter of the test bar decreases, the curve for cooling rate versus distance from the quenched end in sizes less than 1 in. in diameter will not be the same as for the 1-in. diameter. These smaller specimens therefore are useful only for comparing empirically the hardenability of successive heats of steel. If hardenability in terms of cooling rate is desired on small specimens, it may be obtained by the insert test bar. The radiation loss from this test bar is the same as from the standard 1-in. diameter bar; consequently, the cooling rates at all distances from the quenched end are the same as for the standard 1-in. bar.

The test specimens are machined as shown in Fig. 7. The hole is slightly larger than the test piece. This provides an annular space to be filled with a low melting alloy such as Wood's metal which provides thermal contact between the test piece and its 1-in. diameter cylindrical sheath. In use, the sheath is warmed above the melting point of the alloy, the required amount of Wood's metal poured in, the test piece is inserted, and the stud screwed in, forcing the test specimen firmly against the bottom of the hole. The assembly is then heated and quenched as prescribed for the standard hardenability test procedure. After the quench, the assembly is warmed in boiling water to melt the Wood's metal and the test specimen removed and tested as prescribed for the standard specimen.

The composition of Wood's metal used is 50% bismuth, 25% lead, and 25% tin and has a melting point of 200 F.

Selected References on Hardenability Testing

1924

H. J. French & O. Z. Klopsch – "Quenching Diagrams for Carbon Steels in Relation to Some Quenching Media for Heat Treatment" – Transactions, American Society for Steel Treating, Vol. 6, 1924, pp. 251-294.

■

1930

H J. French – "The Quenching of Steels" – American Society for Steel Treating (ASST) – Copyright 1930.

B. F. Shepherd – "Inherent Hardenability Characteristics of Tool Steel" – Transactions ASST, Vol. 17, 1930, p. 90.

G. V. Luerssen – "Some Notes on the Behavior of Carbon Tool Steel on Quenching" – Transactions, ASST, Vol. 17, 1930, p. 161.

■

1932

E. C. Bain – "Factors Affecting the Inherent Hardenability of Steel" – Transactions, ASST, Vol. 20, 1932, p. 385.

■

1934

H. Scott – "Some Problems of Quenching Steel Cylinders" – Transactions, ASM, Vol. 22, 1934, pp. 68-94.

G. V. Luerssen and O. V. Greene – Discussion of Paper by B. F. Shepherd, "P-F Characteristics of Steel" – Transactions, ASM, Vol. 22, 1934, p. 979.

B. F. Shepherd – "The P-F Characteristics of Steel" – Transactions, ASM, Vol. 22, 1934, p. 979.

■

1936

R. Schempp – "Quality Tool Steel" – *Metal Progress*, Vol 30, August, 1936, p. 68.

■

1938

J. L. Burns, T. L. Moore and R. S. Archer – "Quantitative Hardenability" – Transactions, ASM, Vol. 26, 1938, p. 1.

W. E. Jominy and A. L. Boegehold – "A Hardenability Test for Carburizing Steel" – Transactions, ASM, Vol. 26, 1938, p. 574.

Thomas G. Digges – "Effect of Carbon on the Hardenability of High Purity Iron-Carbon Alloys" – Transactions, ASM, Vol. 26, 1938, p. 408.

■

1939

M. A. Grossmann, M. Asimow, and S. F. Urban – "Hardenability of Alloy Steels" – Transactions, ASM, 1939, pp. 124-190.

W. E. Jominy – "A Hardenability Test for Shallow Hardening Steels" – Transactions, ASM, Vol. 27, 1939, pp. 1072-1085.

(*Concluded on p. 44*)

SAE National Emergency Steels Approved in Sweeping Revision

REVISION of SAE steel compositions by the Iron and Steel Division of the SAE Standards Committee, working in cooperation with the American Iron and Steel Institute, in progress for the past six months, was completed at the meeting of the SAE Iron and Steel Division in Detroit, Dec. 5. The total number of compositions in the revised list for the 1942 SAE Handbook is 79, compared with 72 contained in the 1941 SAE Handbook.

In the carbon group four new compositions were added and four old ones discontinued. Two new free-cutting steels were added, while five of the old nickel-chromium compositions were deleted. The greatest change was made in the molybdenum series, twelve analyses being added, to meet in part the trend away from the nickel and manganese steels due to emergency shortages.

The changes do not include the Chromium-Nickel Austenitic Steels and the Stainless Chromium Irons (p. 307, 1941 Handbook), all of which remain the same but are subject to review.

Although the nominal carbon contents throughout have been reduced in general to a 5-point spread, in some cases, the spread is as much as 13 points in the high-carbon series. Throughout the alloyed groups the silicon content has been uniformly specified as 0.20 to 0.35, except in the case of Silicon Manganese Steel.

This revision has introduced some new SAE steel identification numbers with final digits other than 0 or 5 as heretofore, in order to indicate the approximate mean carbon content in the revised steels. Prefix letters that have been in use for several steels are replaced by straight number designations, with provision for the transition over a sufficient time to permit steel users to change their drawings and other records without undue trouble or inconvenience.

By adjusting differences that existed previously in both the SAE and AISI compositions and numbers, these standards are now in agreement throughout and will be designated by the SAE numbers in both standards.

In the new compositions, when check analyses are made of the material, the composition based on the average of all the separate determinations made must fall within the limits ordered. The separate determinations may vary from the range or limits ordered to the extent of standard tolerances except that the elements in any one melt may not vary both above and below the specified range or limits.

Accomplishment of this modernization and harmonization of steel compositions by the SAE and AISI will do much to expedite preparation of the List of National Emergency Steel Specifications by the OPM Administrative Committee on Steels. This Committee is sponsored jointly by the SAE, the AISI, and the ASTM, with the cooperation of the Government military services. Iron and Steel Division Chairman F. P. Gilligan is the Society's representative, and J. B. Johnson, chairman of the SAE Aircraft Materials and Processes Coordinating Subdivision, is alternate on this OPM Committee.

Another important accomplishment by a representative group of steel manufacturers and automotive steel users from the AISI and from among the SAE Division members, was the preparation of several low-alloy steel compositions that were submitted to the OPM as substitutes for regular standard alloy steels during the national emergency. The Division recommended that these steels be designated as the National-Emergency 8000 Series.

The Division also approved the Hardenability Test that was reported by the Subdivision of which E. F. Davis is chairman and the Sub-group under the chairmanship of A. L. Boegehold; this new test will be included in the 1942 Handbook.

The heat-treatment data in Part VI, 1941 Handbook, were revised in accordance with the revised list of compositions, while the old physical property charts (pp. 351-386, 1941 Handbook) were replaced by four new generalized charts for Hardness versus Tensile Strength; Tensile Strength versus Reduction of Area; Tensile Strength versus Yield Point in Terms of Per Cent of Tensile Strength; and Hardness versus Tempering Temperature. These charts, when used in combination with the new hardenability test will permit a more reliable method of selecting steels than by the old physical property charts.

The SAE standard for Automotive Gray Iron Castings was revised in a few details to bring the compositions into agreement with the latest ASTM specifications, A159-41.

Council Passes Amendments To Society's By-Laws B1 and B6

TWO amendments to the Society's By-Laws were made recently and approved at the Dec. 12 Council meeting. One refers to article B1 and makes it compulsory for a candidate for membership to have references from at least one member of the Society.

The other, refers to article B6 which is to be amended as follows:

"B6 – The Secretary shall present to the Council at each meeting, applications of candidates for membership in the Society, except in the case of Honorary Members. Election of candidates for membership in the Society, other than Honorary Members, may also be had by letter ballot of the Council. In case a letter ballot is had, a majority vote of the entire Council shall be necessary for the election of a candidate to membership; and two negative votes shall defeat an election. A notice of such proposed election by letter ballot shall be mailed by the Secretary to each member of the Council at least twenty days in advance of the date set for the closure of such election.

"The name of an applicant for membership must be printed in at least one issue of a publication of the Society, prior to election. The Secretary shall announce to candidates the result of the action on the application."

Sees Fewer Fuel Grades As Aid to Fighting Forces

▪ Wichita and Tulsa Groups

SIMPLIFICATION and standardization of fuels and lubricants for use by the U. S. motorized and armored forces is a vital necessity for successful operation as revealed by the recent army maneuvers, C. M. Larson, Sinclair Refining Co., told some 150 members and guests at a joint meeting of the Wichita and Tulsa Groups, held in the Allis Hotel, Wichita, Kan., on Dec. 6.

The simplification and standardization problem has been surveyed, and definite recommendations have been made, Mr. Larson said, during a talk entitled: "Simplifying Fuels and Lubricants for Mechanized Fighting Forces." However, he added, only through education and centralization of control can the full benefits to individuals and to those responsible for the ultimate success of this program be secured.

"Maintenance data of the Third Army in Louisiana and of the First Army in the Carolinas make it possible to present in detail the various obstacles to fuel and lubricant distribution and the failures related to various petroleum products during the maneuvers," Mr. Larson said, adding, "The use of pipelines laid to handle 80 octane gasoline to ground vehicles and 100 octane gasoline to aircraft, is an assured way of handling fuel to the front. This was one of the

demonstrations of the First Army in the Carolinas."

It was the speaker's belief that only through the cooperative planning of all Army, Navy, and Federal agencies, can the fullest utilization of fuels and lubricants be had through standardization. "Then," he said, "the Quartermasters Corps can keep the lowest possible inventory of grades and sizes of metal packages and the maximum distribution efficiency can be effected without error in handling and in servicing the mechanized fighting equipment."

Mr. Larson said the battle grounds of this strife are the oil fields; that even though this country, after a year of planning, is ahead of the British today, there is a need of a closer broad-range program along the line of the petroleum products specified on the simplified charts now in production for the motor and armed forces, both for tactical operation and detached service.

"This goal of perfection is now being handled for the Army through the War Department Committee on Liquid Fuels and Lubricants," Mr. Larson said, "and by the Navy through the Bureau of Ships and Bureau of Aeronautics. Industry would do well to cooperate by converting their equipment requirements to the standard nomenclature for fuels and lubricants."

Lt.-Col. M. B. Chittick, U. S. Army, Chemical Warfare Service, who gave a speech before the Chemical Society of Wichita that same evening, later came over and addressed the SAE groups, while Mr. Larson gave a talk before the Chemical Society audience.

Preceding the SAE meeting there was an inspection trip through the Cessna Aircraft Co. plant, in which a large group participated.

Brown Discusses Remedies For Induction System Icing

▪ **So. New England**

AT the Dec. 3 meeting in the Hotel Bond, Hartford, Arthur A. Brown, Pratt & Whitney Aircraft, spoke to the Southern New England Section on "Icing of Aircraft-Engine Induction Systems."

Mr. Brown gave a thorough description of laboratory tests carried out in the refrigerated wind tunnel of the B. F. Goodrich Co. in Akron, and in a special new laboratory at the York Ice Machinery Corp. This description was supplemented by pictures of the apparatus and tables of data.

Ice which collects in the induction system was divided into three classes: impact ice, throttle ice, and fuel evaporation ice. "Impact ice" is ice collected from the outside atmosphere; "throttle ice" is that which is formed at or near the throttle when the throttle is in a part-closed position due to the cooling effect of the increase in kinetic energy of the air in the restricted flow region; "fuel evaporation ice" is that which is formed due to the cooling effect of the fuel after its injection into the air stream.

The results of the tests, Mr. Brown said, indicated that the danger from "impact ice" can be eliminated by attention to airscoop design, that the use of pre-heat can be effective and is to be preferred to application of alcohol for the removal of "throttle ice" and "fuel evaporation ice" and that with a type of fuel discharge nozzle developed by Pratt & Whitney Aircraft there is no operating hazard from "fuel evaporation ice" forming in the blower throat.

Cites How Additives Aid Heavy-Duty Service Oils

▪ **Philadelphia**

ENGINE tests are the only safe criterion of the suitability of lubricating oil additives, for some detergent dopes which increase oxidation in the laboratory reduce oxidation in engine tests, J. P. Stewart, Socony-Vacuum Oil Co., Inc., told Philadelphia Section members and guests at the Nov. 12 meeting. The best combination for severe commercial service, he said, is a solvent-refined oil plus selected additives. Mr. Stewart opened his talk on "Lubricants for Heavy-Duty Service" with slides showing the appearance of sludge, "coffee-grounds" deposits, stuck rings, and lacquered pistons, as well as analyses showing the characteristic composition of the various types of deposits.

To demonstrate how sludge forms, Mr. Stewart added one part of oxidized, but clear, oil to four parts of new, straight mineral oil and warmed the mixture. The sample then was passed around so all could see the sludge particles that had been formed.

A detergent additive would have prevented the oxidized particles from coagulating, Mr. Stewart explained, thus keeping them in suspension. Trouble from this cause occurs particularly when the crankcase is drained and fresh oil added, he said. The old oil, remaining in the engine (as much as 20% of capacity), mixes with new, straight mineral oil and then heated, produces a precipitation which may prevent the engine from starting once it has cooled down. Moreover, Mr. Stewart said, the sludge clogs oil filters and screens.

It is essential to find a proper balance between stability to oxidation and detergency, Mr. Stewart said. Some dopes that improve one characteristic make the oil worse in the other regard. Also, the base oil to which the dopes are added affects the performance of a given dope.

Dr. John C. Geniesse, Atlantic Refining Co., opened the discussion with a further clarification of the function of a detergent: to act as a washing agent to remove sludge formations from the engine parts, and to disperse the sludge particles to prevent agglomeration so that the particles remain small and stay in suspension. The trouble with lubrication, Dr. Geniesse said, was due

Post-War Outlook and 'Freezing' Aircraft Design Discussed by Experts at 2-Paper Detroit Meeting

▪ **Detroit**

CARRYING on with its program of meetings open only to members and applicants, the Detroit Section on Nov. 17 heard papers by F. C. Crawford, president, Thompson Products, Inc., and Major B. S. Kelsey, pursuit project officer, Wright Field.

Mr. Crawford, who was a participant in "Fortune's" Tenth Round Table Conference on post-war unemployment, used incidents of the Round Table Conference in his talk to the Detroit Section on "Free Enterprise and the Post-War Blueprint."

When the current war and defense program are over, something like 60 to 80% of the new aircraft factories still will be needed to maintain the military air fleet and provide replacements, it is now widely agreed, according to Mr. Crawford. In addition, he said, with the concentration of Pullman traffic and first class mail in airplane movements, the aircraft industry should be able to avoid the slump that has sometimes been predicted for it. He pointed out, however, that there would be a problem in making up for the $30,000,000 to $40,000,000 national income expenditures that will be cut off when the war is over. The hope for the future, he said, lies in new inventions and new industries, with the freedom to create and to produce.

Mr. Crawford asserted that his contacts with some of the "long-haired, dreamy planners" who hold government posts have convinced him that businessmen and engineers should become vocal in the expression of their ideas to avoid the possibility that radical plans to "spend and spend and tax and tax" theories will dominate the American government in the post-war period. There is already evidence that some of the super-planners have hopes for some form of dictatorship, and the chance to practice the theories they propound, Mr. Crawford said.

Major Kelsey's topic "Frozen Design" had to do with the possibility of permanently fixing the design of military airplanes to facilitate mass production.

Frozen design leads to frozen thinking and that leads to destruction, Major Kelsey declared.

"However, in airplanes and military equipment you can't wait for 'perfection' to step in; some place along the line you have to stop fooling around and go to work," he conceded, adding that "the stage where you decide to 'grow' in the production of military airplanes" is the only freezing of design that is possible.

One of the reasons cited by Major Kelsey for design changes after production has started, is that of obtaining the best possible quality. "Quality is a serious matter to the airplane pilot," he said. "The high-speed airplane is the equivalent of a projectile of high velocity and minor lack of quality can prove fatal to the crew and a waste of the airplane. When the question of changes comes up," he said, "it is necessary to evaluate the worth of the changes in terms of numbers of airplanes versus quality."

As evidence of the fact that changes cannot be eliminated entirely, even after an airplane has been in production, Major Kelsey stated that in October, one small military plane design was subjected to 2000 changes, some minor and some of a more major nature. This plane, he said, had a three or four year history behind it.

The object of attempts to freeze design is to get a steady flow of airplanes from production lines with a minimum of change, he said. If design changes, as they are found necessary, are saved up and all put into effect at once it generally means that production must come to a stop. There follows a period when much inertia must be overcome to get production lines moving again, he indicated. The better goal is the steady flow of airplanes with little change between each plane, and he inferred that this goal is most easily attained by "working in" changes day to day.

to more and more power with less and less engine and less and less engineering.

Adolf Gelpke, Autocar Co., reported that a ring job is required only after 170,000 miles in one instance, but very much sooner in another operation that uses similar equipment for similar service, the only difference apparently being the oil. L. M. De Turk, J. G. Brill Co., said wear is about five times greater with the detergent oils than with straight mineral oils, although that was not yet a serious factor in bus operation since the higher figure is only about 0.003 in. per 100,000 miles.

The chairman of the evening, Dr. F. L. Miller, Esso Laboratories, Standard Oil Development Co., reported on the action of filters on oils containing additives. In the laboratory, a clean, doped oil is not affected even by a fuller's earth filter, but in an engine the carbon and sludge are filtered out and the additive goes out with them. He reported that better results have been obtained with doped oils and no filter than with straight mineral oils and a filter. Dr. Miller added to the explanation of detergency by pointing out that a diesel which throws down a lot of carbon in the blowby needs a cleansing action to keep the rings free, whereas a passenger-car engine in heavy commercial service needs a dispersing agent to prevent sludge formation. Probably 90% of all requirements can be met with a straight mineral oil, he said, but the demand for improved oils for heavy-duty service is increasing and is already here in sufficient force to require the use of additives.

Henry L. Brownback, consulting engineer, pointed out that a great deal of lubrication trouble can be traced to the fuel. A French aircraft engine which had given lubrication trouble was cured by using a higher octane gasoline, he stated. Taxi, bus, and motor freight operators often use inferior fuel and therefore, have troubles that appear to be due to the oil or the lubrication system design, Mr. Brownback said.

In closing, Mr. Stewart emphasized the necessity of designing engines so that they drain clean with the minimum amount of old oil trapped up in the engine.

Says Aircraft Designers Neglect Fuel Pump Systems

▪ Dayton

THAT fuel systems are a portion of the aircraft which is too often neglected by the designer was an opinion expressed by Frederick W. Heckert, vice president, Curtis Pump Co., in a paper delivered to the Dayton Section, Biltmore Hotel, Dayton, Ohio, Nov. 24.

In defining a satisfactory fuel system Mr. Heckert said: Fuel tanks should be constructed so that outlet lines will be covered in all normal flight operation; tanks should be properly vented; hydraulic losses should be held to an absolute minimum especially on the suction side of the pump; the number of traps in the fuel lines and various units should be a minimum; the emergency pump should be reliable and quickly responsive; control means for fuel selection should be simple, reliable and easily interpreted by the pilot and crew members; fuel-line connections should be held to a minimum and should be so located that they are free from vibration; unnecessary units and gadgets should be avoided; and lastly, the system should deliver fuel which is free from air and vapor to the engine at the required pressure and quantity.

ASTM-SAE Rubber Group Developing Emergency Compounds

APPOINTMENT of Subcommittee IV to develop a minimum number of standard mechanical rubber compounds as a conservation measure during the emergency, was formally approved by ASTM-SAE Technical Committee A on Automotive Rubber at a meeting held in Detroit on December 3. Chairman of the Committee is W. J. McCortney, Chrysler Corp. Members include C. J. Cleary, U. S. Army Air Corps, Wright Field; J. E. Sullivan, Bureau of Aeronautics; J. H. Deering, Ford Motor Co.; A. W. Carpenter, B. F. Goodrich Co.; H. L. Ebert, Firestone Tire & Rubber Co.; E. G. Kimmich, Goodyear Tire & Rubber Co.; J. D. Morron, U. S. Rubber Co.; and C. E. Zwahl, Chevrolet Motor Division, GMC.

This subcommittee was also assigned the job of developing a standard for hose for cooling systems for use with substitute antifreezes, such as kerosene.

The Committee also appointed a subcommittee to develop a classification for synthetics. This subcommittee is headed by J. H. Deering.

Under the sponsorship of the Committee, steps are being taken to develop ten standardized reference durometers against which inspection instruments can be calibrated.

To date, Technical Committee A has completed standards for rubber engine mounts, hydraulic vacuum and air brake hose, and has in progress a standard for stock for live rubber bumpers.

Before discussing the work done by his company in developing fuel systems for higher altitudes, Mr. Heckert explained that the primary difficulty to be avoided in the design and layout of fuel systems is vapor lock. This is the partial or complete interruption of fuel flow due to the formation of a mixture of fuel vapor, fixed gases and air. The amount of vapor mixture formed depends on the fuel characteristics, the temperature and pressure in the fuel tank, the pressure drop or boost in the fuel lines, the cooling or heating of the fuel passing through the fuel channels, and the design of the particular fuel system.

After considering the limitations of the existing systems and being satisfied that vapor lock would still occur at high altitudes with pumps located below the hydraulic gradient, Mr. Heckert developed an electric motor-driven centrifugal pump to be employed in series with the engine-driven pump. This type of pump uses centrifuge action to reject air and vapor fractions from the liquid. This pump delivers vapor-free liquid to the engine pump at pressures above ambient atmospheric pressure, and the engine pump then delivers the fuel to the carburetor.

Besides fulfilling the requirements of a satisfactory high-altitude fuel system, the booster method was found to have several other advantages. For example, it is now possible to return the engine pump to the engine drive, where it had already proven to be very reliable, and to avoid the development of a new line of engine pumps. It was found that engines which were equipped with high-pressure injection carburetors started much more easily and with less exhaust firing when the booster pump was used to prime, purge and pressure the system. A more recent function of the booster pump is that of taking over the duty of the emergency hand pump. This is done by increasing the operating speed of the booster so that its discharge pressure will be sufficient to operate the engine in the event of an engine-driven pump failure. Still another duty that can be imposed on the booster is transfer of fuel from one tank to another by suitable flow control valves.

Describes Advantages of "Two-Control" Planes

▪ Southern New England

AN historical outline of the development of "two-control" airplanes, a general discussion of their performance and structural characteristics, and a description of the plane "Skyfarer," were given by Prof. Otto C. Koppen, of the Massachusetts Institute of Technology, at the Nov. 13 meeting of the Southern New England Section. The "Skyfarer" was designed by Prof. Koppen, licensed by the CAA, and now is in production by the General Aircraft Corp., Lowell, Mass.

Of strictly "two-control" design, Prof. Koppen's plane has no rudder at all, merely ailerons and elevators with independent controls. The yawing effect of slipstream rotation, counteracted in a conventional type of airplane at take-off by the use of the rudder, is greatly reduced by two large vertical fins on the tail at the ends of a long horizontal stabilizer. The distance between the fins is greater than the effective diameter of the slipstream.

The steerable front wheel of the tricycle landing gear aids longitudinal control during the take-off. A degree of longitudinal stability sufficient to control aileron yaw and to ease the strain of piloting in gusty air, is achieved through the large area of the twin vertical tail surfaces.

The plane is "spin-proof" and cannot be side-slipped. Controllable flaps make unnecessary the slide-slip technique used in conventional cross-wind landings.

The tricycle landing gear gives the "Skyfarer" pilot excellent visibility in maneuvering the plane on the ground, in taking-off and landing; greatly increases the range in the use of wheel brakes; and makes landing in high winds a common and safe practice.

Cites Ways to Increase Diesel-Engine Power Output

▪ Milwaukee

THREE possibilities for increasing the power-output of diesel engines were discussed by C. G. A. Rosen, assistant chief engineer in charge of diesel research, Caterpillar Tractor Co., before a group of over 150 members, student members, and guests of the Milwaukee Section, at the Nov. 7 meeting. Mr. Rosen outlined these possibilities as: (1) Supercharging in four-cycle operation – by which 20 to 35% increase in bmep can be expected, and up to as high as 80% increase in specially-designed units, (2) Two-cycle operation, (3) Kadenacy System. Mr. Rosen spoke on "New

(*News of Society continued on p. 40*)

SAE ANNUAL

JAN. 12-16 • BOOK-CADILLAC HOTEL, DETROIT

MONDAY, JAN. 12

10:00 A.M. **Transportation & Maintenance**

Low-Octane Fuel Symposium

10:00 A.M. **Aircraft**

Progress in Structural Design Through Strain Gage Technique
– C. R. STRANG, Douglas Aircraft Co.

Light Plane Design and Development
– OTTO C. KOPPEN, Massachusetts Institute of Technology

2:00 P.M. **Truck & Bus**

Characteristics of the Volute Spring
– BERNHARD STERNE, Chrysler Corp.

2:00 P.M. **Aircraft**

Ground Testing vs. Flight Testing of Aircraft Engines
– J. B. KENDRICK, Vega Airplane Co.

Fire Control
– GEORGE L. PIGMAN, Civil Aeronautics Administration

8:00 P.M. **Junior Student**

Auspices Detroit Section

Effects of Air Raids on England
– ROLAND CHILTON, Wright Aeronautical Corp.

Your 1972 Model – I'd Like to Drive It
– T. A. BOYD, General Motors Corp.

★ ★ ★

TUESDAY, JAN. 13

10:00 A.M. **Transportation & Maintenance**

Forum: Salvage for Defense

Building Up of Worn Parts
– W. J. CUMMING, Surface Transportation Corp.

Juggling Metals
– HERBERT HUGHES, Automobile Manufacturers Association

Welding in Maintenance
– R. H. CLARK, Consolidated Edison Co.

Retreading Tires
– M. E. NUTTILA, Cities Service Oil Co.

10:00 A.M. **Aircraft Engine**

Limiting Factors of Overhaul Periods for Aircraft Engines
– MARVIN WHITLOCK, Amercian Airlines, Inc.

2:00 P.M. **Brakes**

Six-Wheel Braking and Its Related Problems
– M. C. HORINE and W. F. BENNING, Mack Manufacturing Corp.

2:00 P.M. **Aircraft Engine**

Air Flow Through Intake Valves
– G. B. WOOD, JR., Massachusetts Institute of Technology; D. U. HUNTER, Lawrence Engineering Corp.; E. S. TAYLOR, and C. F. TAYLOR, Massachusetts Institute of Technology

Controllable Pitch Propellers for Light Airplanes
– W. E. BURNHAM, Freedman-Burnham Engineering Corp.

8:00 P.M. **Business Session**

8:15 P.M. **Passenger Car**

Engineering Experimental Methods and Organizations
– C. R. PATON, Packard Motor Car Co.

Inventions for Victory
– LT.-COL. L. B. LENT, National Inventors' Council

MEETING and Engineering Display

WEDNESDAY, JAN. 14

10:00 A.M. — **Passenger Car**

Alloy Steels as Affected by the Critical Metals Restrictions
– E. C. SMITH, Republic Steel Corp.

Progress on Standardization of Automotive Rubber Specifications and Tests
– L. A. DANSE, Cadillac Motor Car Division, General Motors Corp.; A. W. CARPENTER, B. F. Goodrich Co.; W. J. McCORTNEY, Chrysler Corp.; and E. G. KIMMICH, Goodyear Tire and Rubber Co.

2:00 P.M. — **Performance**

Operation and Maintenance of Diesel Engines in Inter-City Truck Service
– J. L. S. SNEAD, JR., Consolidated Freightways, Inc.

Ignition Accelerators for Compression Ignition Engine Fuels
– J. S. BOGEN, Universal Oil Products Co.

An Optical Oscillograph for Engine Investigations
– K. J. DE JUHASZ, Pennsylvania State College

6:30 P.M. — **Dinner**

(Limited to SAE members and applicants)

TORE FRANZEN, Chairman Detroit Section

O. E. HUNT, Toastmaster

A. T. COLWELL, President SAE

A. W. HERRINGTON, President-elect

The Effect of National Defense Development Work on Future Automotive Engineering
– FRED M. ZEDER, Chrysler Corp.

THURSDAY, JAN 15

10:00 A.M. — **Passenger Car**

Designing for Alternate Materials
– THOMAS A. BISSELL, SAE Journal

Problems Involved in Changing from Aluminum to Cast Iron Pistons
– W. S. JAMES, Studebaker Corp.

2:00 P.M. — **Diesel Fuel Injection**

A New Fuel Injection Nozzle for High Speed Diesel and Gasoline Injection Engines
– C. R. ALDEN and R. K. WELDY, Ex-Cell-O Corp.

Fuel Injection Theories Modified in Practice
– LLOYD E. JOHNSON, Caterpillar Tractor Co.

8:00 P.M. — **Passenger Car Body**

The Automotive Body Engineer in Aircraft
– JOHN C. WIDMAN, Murray Corp. of America

FRIDAY, JAN. 16

10:00 A.M. — **Fuels & Lubricants (Lubricants)**

Cooperative Engine Wear Studies
– F. L. MILLER, Standard Oil Development Co.; A. L. BEALL, Wright Aeronautical Corp.; O. C. BRIDGEMAN, National Bureau of Standards; and H. A. EVERETT, Pennsylvania State College.

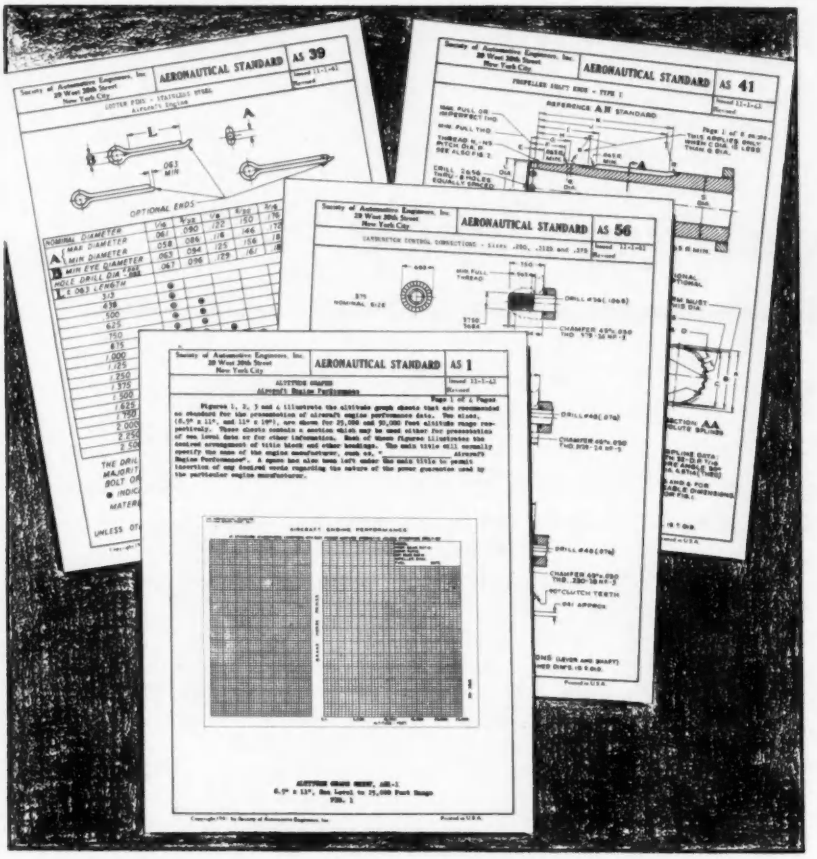
The Testing of Heavy Duty Motor Oils
– H. C. MOUGEY, General Motors Corp., and J. A. MOLLER, The Pure Oil Co.

An Oil Corrosion Tester
– NEIL MacCOULL and A. C. SCHOLP, The Texas Co., and E. A. RYDER, Pratt & Whitney Aircraft

2:00 P.M. — **Fuels & Lubricants (Fuels)**

1941 CFR Road Detonation Tests
– J. M. CAMPBELL, General Motors Corp.; R. J. GREENSHIELDS, Shell Oil Co.; W. M. HOLADAY, Socony-Vacuum Oil Co., and C. B. VEAL, Society of Automotive Engineers

A Refiner's Viewpoint on Motor Fuel Quality
– W. M. HOLADAY and JOHN HAPPEL, Socony-Vacuum Oil Co.



42 SAE AIRCRAFT-ENGINE STANDARDS

•

Approved by AERONAUTICS DIVISION

THE Aeronautics Division of the Society of Automotive Engineers' Standards Committee approved 42 aircraft-engine standards on Oct. 31, within eight months of the inauguration of the extensive project. These standards are now available to everyone interested.

Initiated immediately after a request for developing standards in the aircraft industry by the Office of Production Management on Feb. 28, the task was divided between four subdivisions, serving as steering committees, and 34 subcommittees, each charged with a specific assignment. More than 130 aeronautical engineers on these committees have been engaged in the development of these standards.

During this work the technical requirements of the Army and Navy were thoroughly considered, and each standard was developed to satisfy both the manufacturing production needs and the tactical and maintenance requirements of the military services. The military services were represented through the cooperation of the representatives of the Army, the Navy, the Aeronautical Board, and other interested Government agencies.

The standards approved at the Los Angeles meeting pertain largely to problems of interest to the aircraft-engine manufacturers. The range of standards included are: standard altitude graph sheets for the presentation of aircraft-engine performance, standard carburetor control connections, standard carburetor flanges, propeller shaft ends, tachometer drives, magnetos, aircraft-engine bolt heads, aircraft-engine screw heads, aircraft-engine hexagon nuts, lockwire cotter pins, procedures and equipment for the preparation of engines for shipment and storage to prevent corrosion, standard definitions of aircraft-engine terms, as well as symbols and sketches for pressures and temperatures in an aircraft-engine induction system.

In addition, a Manual of Aircraft-Engine Drafting Room Practice was approved and is ready for distribution throughout the aircraft-engine industry to all those interested (see December SAE Journal, p. 41).

The group of standards approved at this meeting was developed by various subcommittees of the SAE Aircraft-Engine Subdivision and are expected to prove of great value to the industry during and after the current emergency.

In the development of these standards, the membership of each subcommittee on a particular specialized subject was determined on the basis of the selection of the most capable experts available in the entire industry today. Each subcommittee was responsible for coordinating its recommendations with all interested manufacturers and users as well as the proper government agency before submitting the proposed standards to the parent committee for further review, which in this case was the Aircraft-Engine Subdivision.

All adverse comments were in turn summarized by the Aircraft-Engine Subdivision and referred back to the individual subcommittees for further consideration and appropriate recommendations. Standards presented and approved by the Aeronautics Division at its meeting on Oct. 31, represent the final recommendations of each responsible subcommittee after due consideration of all comments received.

Although this represents the first group of standards completed, each committee still has an extensive program of work awaiting its attention, and additional new stand-

ards will be completed and approved during the next few months as rapidly as the work can be handled. In addition, the Aircraft-Engine Propeller Subdivision and the Aircraft Accessories and Equipment Subdivision have a series of subcommittees hard at work in their own fields and a large number of standards are in process of coordination with interested aircraft, and aircraft equipment manufacturers and users.

The Aeronautics Division consists of the following: Arthur Nutt, *chairman,* Wright Aeronautical Corp.; Hall Hibbard, *vice chairman* (Aircraft), Lockheed Aircraft Corp.; L. S. Hobbs, *vice chairman* (Engines), Pratt & Whitney Aircraft; Val Cronstedt, Pratt & Whitney Aircraft; J. B. Johnson, Air Corps, Wright Field; William Littlewood, American Airlines, Inc.; Erle Martin, Hamilton Standard Propellers.

The particular group of standards listed above is a result of the work of the Aircraft-Engine Subdivision of which Val Cronstedt, Pratt & Whitney Aircraft, is chairman.

Copies of any or all of these approved standards are available by writing to the SAE Headquarters. The price is the same as for the SAE Aeronautical Material Specifications, which is 5 cents per sheet with appropriate reductions for large orders.

In addition to the Aeronautical Standards and the Aircraft-Engine Drafting Room Practice Manual approved at the above-mentioned meeting of the Aeronautics Division, agreement was reached by the SAE Aircraft Materials and Processes Coordinating Subdivision at its meeting at the Roosevelt Hotel, Hollywood, Calif., during the week of Nov. 3, on approximately 45 new or revised Aeronautical Material Specifications. Appropriate revisions, in accordance with the decisions of the meeting, will be made in the drafts of these specifications and they will then be presented to the Aeronautics Division for review and approval as rapidly as possible.

As soon as they have been approved by the Aeronautics Division they will be available for publication and distribution to all interested parties in the usual manner.

Aeronautical Standards Approved by the Aeronautics Division, SAE Standards Committee on Oct. 31, 1941

Developed by Subcommittee E-1, Carburetor Installations

Chairman – F. J. Wiegand, Wright Aeronautical Corp.

1. AS 56 – Carburetor Control Connections – Size 1/4, 5/16 and 3/8
2. AS 61 – Primer Electrical Connection – Aircraft
3. AS 62 – Carburetor Flange, Aircraft, 2 Bolt – Single Barrel, No. 3 and 4
4. AS 63 – Carburetor Flange, Aircraft, 4 Bolt – Single Barrel, No. 2, 3, 4, 5, 7 and 9
5. AS 64 – Carburetor Flange, Aircraft, Double Barrel – Size 12 and 16
6. AS 65 – Carburetor Flange, Aircraft, Double Barrel – Size 24
7. AS 66 – Carburetor Flange, Aircraft, Double Barrel – Size 24 (Remote Fuel Discharge Type)
8. AS 67 – Carburetor Flange, Aircraft, Rectangular – No. 9 and Size 12
9. AS 68 – Carburetor Flange, Aircraft, Rectangular – Size 24 and 30
10. AS 69 – Carburetor Flange, Aircraft, Triple Barrel – Size 41

Developed by Subcommittee E-2, Engine Accessory Drives

Chairman – G. N. Cole, Pratt & Whitney Aircraft

1. AS 41 – Propeller Shaft Ends – Type I
2. AS 48 – Gun Synchronizer, Mounting Pad and Drive
3. AS 54 – Tachometer Drive – Type I

Developed by Subcommittee E-3, Magnetos

Chairman – E. K. von Mertens, Pratt & Whitney Aircraft

1. AS 12 – Magnetos, Aircraft, Mountings For
2. AS 13 – Magnetos, Aircraft, Drives For
3. AS 14 – Magnetos, Aircraft, Installation Of Tests
4. AS 15 – Magnetos, Aircraft, Tests Of

Developed by Subcommittee E-5, Standard Parts

Chairman – G. N. Cole, Pratt & Whitney Aircraft

1. AS 30 – Bolt Heads, Hexagon – Aircraft Engine
2. AS 31 – Screw Heads, Flat Fillister – Aircraft Engine
3. AS 32 – Screw Heads, Flat Fillister (Lockwire Type) – Aircraft Engine
4. AS 33 – Nuts, Plain Hexagon – Aircraft Engine
5. AS 34 – Nuts, Castellated Hexagon – Aircraft Engine
6. AS 35 – Nuts, Shear, Slotted Hexagon – Aircraft Engine
7. AS 36 – Washers, Plain – Aircraft Engine
8. AS 38 – Lockwire, Stainless Steel – Aircraft Engine
9. AS 39 – Cotter Pins – Stainless Steel – Aircraft Engine
10. AS 40 – Dowel Pins
11. AS 70 – Flange, Tube – Two Bolt Type – Aircraft Engine

Developed by Subcommittee E-8, Drafting Room Practices

Chairman – J. G. Perrin, Pratt & Whitney Aircraft

1. Manual of Aircraft-Engine Drafting Room Practice

Developed by Subcommittee E-9, Preservation of Engines

Chairman – A. P. Ayers, Pratt & Whitney Aircraft

1. AS 6 – Envelope, Transparent, Moisture-Resistant
2. AS 7 – Plug, Dehydrator – Cylinder
3. AS 8 – Plug, Dehydrator – Crankcase
4. AS 9 – Protector and Cable Attachment, Spark Plug Terminal
5. AS 10 – Indicator, Humidity
6. AS 11 – Equipment, Spray, Corrosion-Preventive Compound

Developed by Subcommittee E-11, Engine Performance Presentation

Chairman – E. F. Pierce, Wright Aeronautical Corp.

1. AS 1 – Altitude Graphs
2. AS 16 – Performance Presentation, Aircraft Engine, Single Speed Engine
3. AS 17 – Performance Presentation, Aircraft Engine, Two Speed Engine
4. AS 18 – Performance Presentation, Aircraft Engine, Two Stage Engine
5. AS 19 – Performance Presentation, Aircraft Engine, Engine for Use With Exhaust Turbo Supercharger
6. AS 20 – Definitions, Aircraft Engine
7. AS 21 – Symbols and Sketches for Pressures and Temperatures in Induction System – Aircraft Engine

"Remember Pearl Harbor" Stimulates

LONG before reports from the Pacific clarified details of the attack by Japan which finally erased the non from non-belligerent, the Office of Production Management began to shift gears in the defense program, converting it lumberously to a victory effort of Gargantuan size.

Reorganization is now under way. With it will come changes in personnel and lines of authority of prime importance to the automotive industry. Already the industry committee set-up of OPM has been changed, with the industrial branches reporting to Knudsen-Hillman instead of to Leon Henderson.

"Remember Pearl Harbor" took its place over a number of official bulletins after 18 months of the warning "Time Is Short." The automotive industry settled down to the victory task with all resources.

Significant facts:

- Civilian manufacturing immediately becomes non-essential – unless sound and complete facts make the individual products appear to be in the interest of defense. (See "OPM Controls All Production," page 28, and "Tire Rationing," page 30.)
- $1 billion a week will be spent for armaments. (See "Defense Progress," page 32.)
- The 40-hr week thesis became a scrap of paper, as orders were issued for a 24-hr day, and in shipyards,

OPM Controls All Production

SWEEPING revisions of Priorities Regulation No. 1 (Aug. 27, 1941) has given the Office of Production Management absolute control of production of "essential civilian" products.

Priorities Regulation No. 1 required manufacturers to *accept* defense orders *ahead* of non-defense. "Defense" orders were defined.

The Amendment (Dec. 23, 1941) provides:

- Orders with B-ratings now must *be accepted* by manufacturers *ahead of non-rated* orders, no matter who the customer is. Unless passenger cars, for example, are given B-ratings, OPM can close down manufacturers by refusing to grant B-ratings to automobiles. "Non-essential" production is already controlled by OPM by a water-tight system of materials (M) orders, many of which include "prohibited use provisions." A whole new series of such amendments have been written to be issued as war demands for materials change from day to day.
- All defense orders not given a specific rating automatically get one of A-10, unless OPM grants higher priority.
- Inventories are under stricter control than ever. Manufacturers may not accept any materials for inventories beyond "a practical working *minimum*."
- Preference ratings of AA will be used for defense orders should such require precedence in production. Otherwise, the procedure of Priorities Regulation No. 1 obtains.

Plastics Hard Hit

Pearl Harbor also means the requisition by the Army and Navy of practically every chemical needed for every known plastic. Plastics chemistry, stimulated by ballistics research and development, will be laid on the shelf for the duration – except for the output of materials needed to arm our fighters.

Experiments on coronized steel strips for radiator fins became at once an academic subject. "Even the substantial 30% saving in copper as estimated means nothing to the motoring public at home when the 70% used in radiator manufacture is needed to avenge Pearl Harbor," a high-ranking Army officer said. And until this war is over, the Army and Navy are in the driver's seat and civilians will walk, if need be, to pay their taxes, he indicated to the SAE Journal.

However, both Army and Navy officials feel that civilian morale is just as essential in today's fighting as military morale. The war is mechanized in so many details that factories are as valuable as fortresses, and workers and management as important as soldiers, sailors, marines, and officers. They concede that as much of the civilian economy must be preserved as possible, but feel that most of our luxuries must be turned into weapons.

There is every likelihood, therefore, that exceptions to general rules will be permitted, but such pleas for materials and equipment must be granted only upon documentary proof of needs, augmented with evidence that the industries involved are doing their share of materials conservation. And inasmuch as OPM is a servant of the military, OPM officials can be expected to be tougher and tougher as our military needs become more and more acute.

Several high Army officers are restive about some of the OPM functions, such as the Bureau of Industrial Conservation which has discussed a number of programs designed to get large tonnages of materials into arms and munitions but hasn't produced results. But in general, they appear to be confident that this test of actual war will shake the organization down and stimulate it to accelerated speed.

OPM's extension of the bright work order was something of a bombshell to those officers who didn't understand it. Coming on the Wednesday following Pearl Harbor's Sunday, it frayed the already jittery nerves of some of the military who verbally lashed the already suffering whipping-boy, the automobile industry.

Requisitioning

OPM has implemented Executive Order 8942 (Nov. 19, 1941) by establishing an Inventory & Requisitioning Section to acquire promptly any war materials from manufacturers and warehouses whenever normal sources of supply become inadequate.

The Section may:

Requisition materials directly, or

Review and approve requisition orders issued by other government agencies.

Survey of existing inventories by OPM's industrial branches will be speeded up, and the new mechanism will tighten up inventories of materials all along the line. Other "property" may also be taken over by the government.

Regulations provide for determining fair compensation for property taken over for war use, it was pointed out.

Tin, Pawn of War, Now Under Control

A pawn in world diplomacy, tin has been nailed down under the strictest of all OPM materials controls (M-43, Dec. 18) after a long series of industry conferences and international sessions, during which the State Department tried to save the oriental face of Siam (later Thailand) which now is an Axis ally. The tin order provides:

- Strict allocation for use,
- Sales and deliveries only with specific permission of the director of Priorities, OPM,
- Only the Metals Reserve Co. or other government agencies may buy imports,
- Tin now afloat cannot be sold except by *special* permission of the director of Priorities.

However, distributors may deliver to their regular customers less than 5-ton lots, subject to Priorities Regulation No. 1 (Aug. 27), but the inventory provisions of this regulation (prohibiting excessive stocks) will be rigidly enforced.

OPM's Reorganization

aircraft, engine, tank, and arms plants, a 168-hr week. (But time-and-one-half pay for overtime will continue, President Roosevelt has indicated.)

- A vast arsenal program, much of it to be built inland as a safety measure, was launched. (Details were withheld as being military secrets.)
- Officials studied elaborate plans for conscripting labor and requisitioning plants should the World War I slogan "work or fight" fail to register with labor and management.
- Engineers may expect "invitations" to enlist their brains and experience against the Axis. (See "Automotive Engineers Needed," page 31.)

Bill Knudsen Today . . . . .

AT his press conference a few days after the Japanese attack on Hawaii and other outposts of the United States, William S. Knudsen, OPM's director general (and Number One SAE member in the nation's war program), was a man transformed in many respects. Widely known for two decades as a tough production boss who got things done for Ford and General Motors, he has acquired more toughness than he has ever shown before.

Quietly – almost softly – he announced that arms must be produced on a 24-hr per day, 7 days a week schedule. But the muscles around his eyes tightened, his jaw snapped shut, and one of his big fists was clenched tightly.

He looked tired as he walked into the room to undertake an ordeal that he tends to shun. But when he began to talk production for winning this war, he swung into his facts with an inspiring vigor.

A bit hesitatingly he adjusted his familiar pince-nez, horn-rimmed glasses; there was a trace of uneasiness as he glanced around the room explaining that when he had heard the news from the Pacific three nights before he had written something. And he read:

"To all Americans working for defense:

"The hour has come. We must center all our efforts on production of the munitions of war.

"America's production engine that is turning now must be speeded up to maximum output. . . .

"The Office of Production Management appeals for the utmost effort from American labor and management that victory may come swiftly" (he looked up) "and be complete."

(He paused.)

"Man-hours worked by willing hands will do it."

He briefly sketched the need for more plants to do the job. They would be placed inland, he said, behind the mountain ranges of the Atlantic and Pacific coasts to make them as inaccessible as possible to enemy bombers.

Present skilled labor potential has not yet been exhausted. But the demand will inevitably increase for skilled workers and skilled supervisors. He warned that the "Work or Fight" slogan of the last war may again be heard. He doubted that conscription of labor along the lines adopted by Great Britain would be necessary.

He brushed aside a question as to how much money would be needed with:

"You don't win wars with money – unless you want to buy your way out." And his muscular jaw clamped down like a vise.

On materials, he likened the United States to the condition of Great Britain. There are thousands of miles of belligerent seas to cross with every ton of imported commodity.

Eighteen months of long hours, without accustomed staff aid or other working facilities, leading a program that by its very nature has kept on multiplying itself, establishing policies which had to be changed and changed again in the light of experience, has added years to Mr. Knudsen's appearance.

But he is tougher.

And he is paying back his measure of gratitude to the country which adopted him, a youthful immigrant from Denmark.

✪

Military vs. OPM Control Is Issue

HARD-DRIVING OPM officials have successfully clamped down on non-defense use of every scarce material used in the automotive industry with either materials orders, allocations, inventory controls, or curtailment of the end product (in some cases all four).

Result: Careful collection of data and firm presentation of the facts is the only avenue open to relief. Through the Automotive Branch, Civilian Supply Division of OPM, for example, the industry speaks.

Proposed modifications of materials restrictions are carefully weighed by the Materials Division of OPM, the factors being the prospective 1942 supply of a given material and the estimated military need.

Already some military spokesmen are wondering if the mechanism of OPM might not encroach upon their time-honored prerogatives. In fact, at least two drafts of proposed legislation to give the Army more power and authority have been seen in the hands of legislators on Capitol Hill, and the House considered HJ-235, a proposal which provided wide military control of industrial profits through taxation.

On the other hand, some OPM officials have remarked "let the Army fight the war – we'll supply the arms."

These diametrically different attitudes forecast a possible struggle behind the scenes of national defense production, particularly because:

1. Those charged with spreading the work, as urged by the President, claim to have found many hitches in the program that have been caused by military slowness in releasing orders to smaller manufacturers already suffering "priorities famine."

High-placed Army officials agree to the principle of spreading the defense effort, but procurement officers are loathe to trust small and relatively unknown manufacturers with huge production schedules of military equipment (much of which is in the category of military secrets.)

2. Faced with shortages of practically every metal used in manufacture, some OPM officials are becoming restive because of Army and Navy "hoarding." The military attitude is that this accumulation of inventories is in the interest of national defense, and many spokesmen refuse to discuss the question in detail.

3. Men with industrial background have been disappointed because of the slowness in releasing large armament orders. The military attitude appears to have been cau-

tion in view of design changes required from month to month in view of developments in combat equipment in use on the battle fronts of the world.

4. Military red tape, stemming from more than 150 years of federal legislation seeking to check expenditures in the public interest, together with government laws and regulations under which OPM works, has made procurement slow.

PD-25A Form Charts Firmer Materials Control by OPM

BEGINNING Jan. 1, a majority of companies in every branch of the automotive field may elect to use the complex, new PD-25A forms through which OPM's Division of Priorities is trying to implement its new program for closely controlled allocation of materials for armament production and for essential civilian requirements.

The new "Production Requirements Plan" – which supplements and may eventually replace the "Defense Supplies Rating Plan" (Priorities) and of which the form PD-25A is the major tool – can be utilized by automotive producers in connection with all of the direct defense work they are doing without question.

No specific definition of what constitutes "essential civilian products" is available, but presumably the new plan would apply to such automotive products as trucks, car and truck replacements parts, and farm equipment which already have had an "A" or "defense" priority rating. Under present conditions, it seems equally certain that PD-25A applications for material for passenger cars, light trucks, and other unrated civilian automotive products would provide just so much extra waste paper and effort. Exactly where the line between essential civilian and non-essential civilian items will be drawn, only time will tell, but our actual entry into a state of war probably insured doubtful products being classified as non-essentials.

Although not immediately needed by manufacturers who already have preference ratings, the PD-25A forms are expected by OPM officials to be widely used because:

- Priority ratings may be obtained for quarterly periods. Thus, one of the important drawbacks of previous rating plans, providing only hand-to-mouth buying, is overcome.
- It provides for granting either 100% of the manufacturer's needs if *all* the products covered in his application are destined for defense or essential civilian use.
- In other cases, the rating will apply only to that part of the material requested for defense or essential civilian products. (See 2, below.)
- A larger number of automotive manufacturers will now be eligible for the limited blanket rating. All they must do is to show that a "substantial proportion" of their production in recent months has been essential to the defense program.
- The new plan will eliminate the necessity for use of bothering with the PD-1's, the heretofore standard for applying for an individual rating. OPM officials expect that the paper work involved in filling defense orders will thus be substantially reduced.
- The number of separate applications for priority assistance to expedite single defense orders will be reduced to a minimum.
- From the standpoint of OPM, the "PD-25A program" will give defense officials a clearer picture of existing inventories and projected needs for scarce materials. However, the man-hours of work to tabulate and analyze the returns on the five-sheet form will be a herculean task, whether performed by the industry committees or the Division of Priorities itself, or with the cooperation of both.

Industry will be asked to read about 5000 words of instruction, and fill out and submit five copies of PD-25A. Space is provided to insert requirements for more than 600 materials under:

- Non-ferrous metals, their oxides and other compounds,
- Ferro-alloys,
- Iron and steel,
- Other materials, and
- Other chemicals.

Space is allowed for unspecified materials required. Letters, *in duplicate*, are asked for in further explanation of some of the points.

Accompanying letters from the manufacturer should explain:

- Any efforts made to conserve, substitute, or simplify to reduce the use of scarce materials.
- Efforts made to date to subcontract a part of the work.
- Sources of supply, such as owned or affiliated warehouses or central stores depots, with the names and addresses of each.

Complete inventory information on all materials is asked for.

In determining what priority will be granted to the manufacturer, the Priorities Division will take into account:

1. The amount of defense or essential civilian production which is involved.
2. The end use of the products. This is to aid OPM to determine the *degree* of the essentiality of the essential civilian product. Police cars, fire engines, sanitation trucks, equipment for Civilian Defense crews, and ambulances were among the automotive vehicles cited to the SAE Journal as "probably essential." OPM spokesmen warned, however, that the buyer of such equipment might have to make a factual presentation to make sure that new equipment of this type is essential. Furthermore, the progress of the war itself is likely to change the degree of essentiality from week to week, they pointed out.
3. The relative scarcity of the materials requested. This degree of scarcity will change with the week-to-week successes or setbacks of our armed forces.
4. The over (and changing) policies of SPAB. Manufacturers must watch these changes more closely from now on.
5. Recommendations of the appropriate industry committees of OPM, such as the Automotive Branch.

Of the 24 main industry advisory committees which have been fully organized, the automotive industry has a stake in the deliberations of seven besides the Automotive Industry Advisory Committee. They are:

- **Rubber,**
- **Farm machinery and equipment,**
- **Iron and steel,**
- **Protective and technical coatings,**
- **Copper and zinc,**
- **Electrical, and**
- **Die casting.**

The manufacturer will:

- *Obtain the PD-25A forms from the Production Requirements Plan Section, Priorities Division, OPM, or from the local OPM field office.*
- *Fill out five copies, the original to be certified by an authorized official, and all five copies to be sent to Production Requirements Plan Section, Office of Production Management, Washington, D. C.*
- *Await notification of priority rating.*

The form may be reproduced by anyone, provided the same phraseology, original form, size and color are used.

Tire Rationing Sets Pattern

RATIONING of merchandise for civilian use by the government has come.

The rubber ration program, announced two weeks before it becomes effective on Jan. 4, will be historic in the annals of a free nation fighting again for the freedom it has achieved and maintained.

The plan, as it stood before the reorganization of OPM, was to have been administered by OPA. However details are finally administered, the impact on the automotive industry will be severe because automobiles and trucks normally use about 80% of the U. S. rubber supply in peacetime.

Estimated military use in 1942 runs above the supplies on hand – and most of our rubber comes from the Pacific.

Leon Henderson, administrator of the Office of Price Administration announced:

1. The prohibition against retail sale of tires, which was to have expired Dec. 22, continues. Spare tires will not be supplied on new cars and trucks.

2. Manufacture of defense and essential rubber products will continue, but golf and tennis balls, bathing apparel, toy balloons, etc., may not be manufactured.

3. The rationing plan:

- Manufacture of automobile tires will be virtually stopped, truck tire output will be curtailed.
- Controls are set on retreaded tire sales, as well as for retreading of tires.
- Monthly quotas will be set up for all tires, depending upon the amount of crude rubber available.
- These 30-day quotas will be broken down into states and counties. Quotas will be established primarily on the basis of *commercial* vehicle registrations.
- State and local rationing boards will

be set up under OPA supervision. These will be advisory.

• Sale of new tires will be restricted to:

(a) Vehicles required for maintaining public health and safety.

(b) Limited group of essential truck operators.

Note that motorists are ruled out unless they can show their local boards that they need new tires for the safe operation of their vehicles. A normal government question to such a plea: "Is it essential for you to use your automobile at all?"

• Certificates will be issued to those proving their need so they can buy tires.

Price control of retail tires is a part of the program, and was worked out by OPA officials in detail before the rationing plan was announced to the public.

Also, ceilings were slapped on reclaimed rubber prices at the price level of the Nov. 5 to Dec. 5 period. About 75% of the rubber reclaimed in the U. S. goes back into tires. A reclamation "drive" is on.

Total 1942 production of synthetic rubber looks now like about 30,000 tons, most of which is earmarked for mechanical uses, none of which is expected to be used in civilian products.

New tire stocks were estimated at between 7 and 8 million in December, with monthly sales for replacements at 4 to 5 million. Inventories are being taken by OPA.

The Rubber Industry Advisory Committee to OPM's Civilian Supply Division, also headed by Mr. Henderson, worked out the details of the rubber manufacturing curtailment program last month.

✪

Warns Against Defense "Promoters"

WHILE Congressmen have been hearing witnesses in an attempt to formalize into law their opinions about defense factory representatives, OPM warned industrial communities to keep away from "dubious promoters" of defense contracts.

Several government officials were shocked when told that such a promoter had tried to negotiate a commission with a prospective subcontractor, based on blueprints bearing the name of an automobile manufacturer, a large defense contractor. The promoter refused to disclose how he got the blueprints, but promised a subcontractor a fee to get him a subcontract.

Floyd B. Odlum, director of OPM's Contract Distribution Division, called attention of local industrial community defense committees, such as those stemming from Chambers of Commerce, to a standard clause in government contracts known as the "covenant against contingent fees," which says:

"The Contractor warrants that he has not employed any person to solicit or secure this contract upon any agreement for a commission, percentage, brokerage, or contingent fees. . . ."

He also barred such contact men seeking commissions or fees from subcontractors for defense work from participating in this type of local group effort.

Several of this type of local defense subcontracting committees have been formed to participate in the defense production effort, and to keep the factories in their respective communities busy in view of materials shortages which have already closed many of the plants working on non-defense production. Those in York, Pa., Peoria, Ill., and Toledo are examples.

John Lord O'Brian, general counsel of OPM, and Attorney General Francis Biddle have agreed to approve in advance such committees in order to protect legitimate groups against trouble that might arise from the federal anti-trust laws which forbid "combinations in restraint of trade."

Mr. Odlum has asked all such organizations of local manufacturers to report their activity to his office, or to one of the 100 local offices of the division with view of assisting them to get contracts for defense implements direct from the government.

Automotive Engineers Needed In Nation's Victory Program

TOP OPM officials are conscious of the need of good engineering personnel throughout the defense organization, and most of them look to automotive engineers as a rich source of engineering abilities.

A few outstanding engineers have enlisted their services, and some defense units boast of a good complement of capable metallurgists, other technologists, and engineers.

Close study of the personnel of the OPM branches, however, shows the SAE Journal that criticism is justified of OPM's lack of sufficient engineers to administer properly the largest and most complex engineering job the world has yet seen.

The simple fact is that there are not enough engineers on hand.

Why are there too few engineers running the defense program?

Here are some of the reasons:

• Industry is hiring all the competent mechanical, chemical and other specialized engineers it can. Thousands of automobile engineers, for example, are working on aircraft, tank, gun, gun carriage, and ballistic problems. Some are in the marine engineering field. Automotive production engineers are in acute demand by some OPM divisions, and the Army and Navy.

• Faced with this shortage, management has been reluctant to make temporary government employment attractive to their engineers. Some assurance is usually needed to encourage an engineer to take a government job at considerably less than his present earning capacity.

• Specific federal laws prohibit a company from paying a government employee to make up the difference in pay.

• Until Pearl Harbor, many engineers have thought of the defense effort as another New Deal program, somewhat akin to the various pump-priming and "made work" efforts such as WPA. Therefore, the whole idea of working for the government has been less than unattractive.

While military spokesmen were discussing a new Army of 5,000,000 men, and Navy officials were receiving reports of unprecedented enlistments, the Contract Distribution Division of OPM called on many automotive companies, among a list of 100 corporations, to "draft" at least four men each for "industrial" specialists to man that growing division.

Sacrifices were asked for, both by the manufacturing companies receiving the letters and by the individuals to be "drafted."

• Men must enlist for the "duration."

• Most of the work will be done in Washington,

• Men must be guaranteed reemployment at the end of the war.

The letter included specifications for the men. (Salary ranges are available from nearly 100 local Contract Distribution offices of OPM, or from headquarters, 462 Indiana Avenue, Washington, D. C.)

Principal Industrial Specialist: College graduate or technical equivalent, machine-operating experience, industrial background including setting up and operation of time-study, estimating, planning, tool design, perpetual inventories, foreman training. *Job:* He will visit large plants, and supervise a staff of subordinates. Must meet with industrialists to discuss manufacturing problems generally, as well as major design problems in some particular field, and be able to address engineering groups.

Senior Industrial Specialist: College engineering graduate with machine operating experience, industrial background including setting up and operating time study, estimating, planning, tool design, or other machine shop controlling function, or a practical man who has had similar experience. *Job:* Will visit smaller factories to "trouble shoot" inefficiencies, poor planning, etc., and make practical suggestions to speed up delivery of arms and components. Must be able to discuss such problems as well as minor design changes with manufacturers and government procurement officers.

Industrial Specialist: College graduate or technical equivalent with machine operating experience, or experienced machinist who has held minor supervisory responsibility. *Job:* Must administer time study, sequence of operation, machine requirements and alternates, estimate time, and be able to prepare concise production reports.

Associate Industrial Specialist: College engineering graduate or machinist who has held minor supervisory responsibilities. *Job:* Must set up time study, establish production rates, and be able to set up operating sequences.

✪

Speeds Up Steel Plant Expansion

William L. Batt, OPM's director of materials, issued orders a few days ago to speed up steel plant expansions.

Method:

Granting high military ratings for materials needed.

Types:

Pig iron facilities to balance present and contemplated finishing facilities and to offset scrap shortage, and

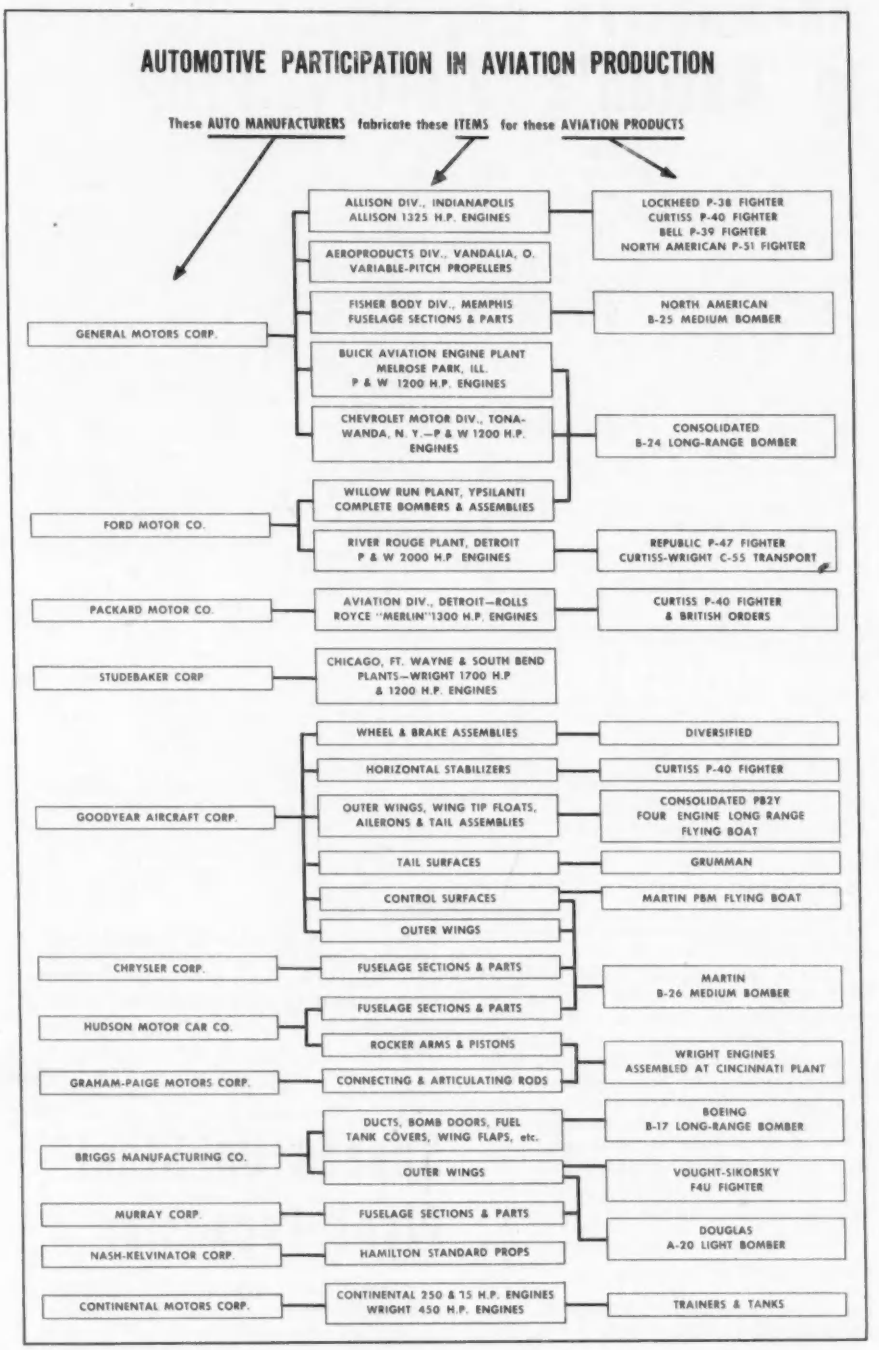
Electric furnace and other finishing facili-

ties to produce more of the alloys required by the military.

Present plants will be air conditioned to provide a dry blast. Steel experts estimate that this will increase pig iron production by from 5 to 8%, will save coke. This means increasing the annual capacity by something like 2,500,000 tons. Installation does not require shutdown.

It takes from 18 to 24 months to complete facilities for each added million tons a year, Mr. Batt told the SAE Journal.

Detailed steel reports will be made regularly to SPAB by the Iron and Steel Branch of Mr. Batt's division, which is now headed by Charles E. Adams, chairman of Air Reduction, a steel company director, and a widely experienced industrialist.


AUTOMOTIVE PARTICIPATION IN AVIATION PRODUCTION
These AUTO MANUFACTURERS fabricate these ITEMS for these AVIATION PRODUCTS
GENERAL MOTORS CORP.
ALLISON DIV., INDIANAPOLIS ALLISON 1325 H.P. ENGINES
LOCKHEED P-38 FIGHTER CURTISS P-40 FIGHTER BELL P-39 FIGHTER NORTH AMERICAN P-51 FIGHTER
AEROPRODUCTS DIV., VANDALIA, O. VARIABLE-PITCH PROPELLERS
FISHER BODY DIV., MEMPHIS FUSELAGE SECTIONS & PARTS
NORTH AMERICAN B-25 MEDIUM BOMBER
BUICK AVIATION ENGINE PLANT MELROSE PARK, ILL. P & W 1200 H.P. ENGINES
CHEVROLET MOTOR DIV., TONAWANDA, N. Y.—P & W 1200 H.P. ENGINES
CONSOLIDATED B-24 LONG-RANGE BOMBER
FORD MOTOR CO.
WILLOW RUN PLANT, YPSILANTI COMPLETE BOMBERS & ASSEMBLIES
RIVER ROUGE PLANT, DETROIT P & W 2000 H.P. ENGINES
REPUBLIC P-47 FIGHTER CURTISS-WRIGHT C-55 TRANSPORT
PACKARD MOTOR CO.
AVIATION DIV., DETROIT—ROLLS ROYCE "MERLIN" 1300 H.P. ENGINES
CURTISS P-40 FIGHTER & BRITISH ORDERS
STUDEBAKER CORP.
CHICAGO, FT. WAYNE & SOUTH BEND PLANTS—WRIGHT 1700 H.P & 1200 H.P. ENGINES
GOODYEAR AIRCRAFT CORP.
WHEEL & BRAKE ASSEMBLIES
DIVERSIFIED
HORIZONTAL STABILIZERS
CURTISS P-40 FIGHTER
OUTER WINGS, WING TIP FLOATS, AILERONS & TAIL ASSEMBLIES
CONSOLIDATED PB2Y FOUR ENGINE LONG RANGE FLYING BOAT
TAIL SURFACES
GRUMMAN
CONTROL SURFACES
MARTIN PBM FLYING BOAT
OUTER WINGS
CHRYSLER CORP.
FUSELAGE SECTIONS & PARTS
MARTIN B-26 MEDIUM BOMBER
HUDSON MOTOR CAR CO.
FUSELAGE SECTIONS & PARTS
GRAHAM-PAIGE MOTORS CORP.
ROCKER ARMS & PISTONS
CONNECTING & ARTICULATING RODS
WRIGHT ENGINES ASSEMBLED AT CINCINNATI PLANT
BRIGGS MANUFACTURING CO.
DUCTS, BOMB DOORS, FUEL TANK COVERS, WING FLAPS, etc.
BOEING B-17 LONG-RANGE BOMBER
OUTER WINGS
VOUGHT-SIKORSKY F4U FIGHTER
MURRAY CORP.
FUSELAGE SECTIONS & PARTS
DOUGLAS A-20 LIGHT BOMBER
NASH-KELVINATOR CORP.
HAMILTON STANDARD PROPS
CONTINENTAL MOTORS CORP.
CONTINENTAL 250 & 75 H.P. ENGINES WRIGHT 450 H.P. ENGINES
TRAINERS & TANKS

What automotive companies are making for what type of fighting aircraft is graphically shown in this chart reprinted from "Aviation," November, 1941. The article in that issue "Where the Auto Makers Stand," from which this was used with special permission, is one likely to be of real interest to every automotive engineer

Defense Progress

EIGHTEEN months ago the nation started its defense program.

A year ago the Office of Production Management was formed to facilitate the acquisition of armaments for the Army, Navy, and anti-Axis allies. A number of automotive executives and engineers volunteered their full-time services.

These months of experience in diverting materials, machinery, men, management, and plants into the makings of the largest arsenal in history are seen by military and defense officials as the priceless foundation for the job ahead.

Branch chiefs and top OPM executives alike began to settle down to their large responsibilities as soon as the jitters of the news from Pearl Harbor had been tempered by a few days of time. Mistakes and consequent changes of policies and numerous critical blasts had played a part in developing a mechanism to buy munitions for our armed forces.

Lack of wholehearted cooperation from important military men is still a vexing problem from OPM's viewpoint, but it already appears that there will be a great deal more of give and take and teamwork from now on.

OPM is trying hard to push the expenditure for armament up to the billion-dollar-a-week level, and knows that it will take twice that or more to win this war.

Highlights of defense progress to date:

- $43 billion in contracts let during 1941; total program to date, $75 billion.
- $12 billion worth of arms delivered and buildings constructed;
- $24 billion to be delivered in 1942, and $36 billion in 1943 were the pre-Pearl Harbor estimates. These will be doubled and tripled as fast as OPM can do it.

Because all armament production is new to American industry, the past year has been a period of education.

OPM cites the growth of aircraft production as an example of industrial achievement never before equaled in the world. In July, 1940, 500 planes were produced. By January, 1941, this had been doubled to more than 1000 a month. The President set a quota of 50,000 a year, or about 1000 a week. OPM considers this task something like that of asking the automobile industry to produce 53,000,000 cars in a year, about twelve times as many as were produced in 1929, or nearly fifteen times as many as in 1940. Airplanes are rolling off production lines in 26 plants, with new facilities being added each month.

Defense construction became another huge item of $8,800,000,000 appropriated during the past 18 months. About a half of this is in place. Land purchased, leased, or transferred from public lands for this construction totals 8½ million acres, or equal to the combined land and water areas of New Jersey and Connecticut. For 1942, further expenditures of $7½ billion—or crowding into twelve months the performance during the past 18. Every week new construction records are being broken.

Nearly all of the 60-odd ordnance plants projected have been completed or started. About half of them are in actual production.

(*Continued on p. 36*)

About SAE Members

A. R. CODE has been released by the Vacuum Oil Co., Pty. Ltd., Melbourne, Australia, for the duration of the war to take the post of Controller of Armoured Fighting Vehicles Production in the Ministry of Munitions. Prior to his acceptance of this post he was acting for a considerable period as technical consultant to the Ordnance Production Directorate of the Ministry of Munitions on tank design, and as chairman of the Automotive Engineering Panel of the Ministry of Munitions. In creating this Panel, Mr. Code selected a number of members of the SAE to act with him in an honorary capacity.

Niles-Bement-Pond Co. recently announced changes in the positions of two executives. They are: **H. D. TANNER,** vice president and general manager of the Machinery Division, to vice president and assistant general manager; and **A. H. d'ARCAMBAL,** sales manager of the Small Tool and Gage Divisions and consulting metallurgist, to vice president. Mr. d'Arcambal will retain his previous duties.

Two SAE members were recently promoted by Fruehauf Trailer Co., Detroit. They are: **ROY A. FRUEHAUF,** vice president and director of sales, to vice president in charge of operations, and **JOHN W. VOTYPKA,** chief engineer, to director of engineering.

A. A. BULL has been named president, Michigan Wire Cloth Co., Detroit. Mr. Bull was formerly president, Handy-Governor Corp., and since the consolidation of that company with King-Seeley Corp., he has been and still is vice president of King-Seeley in charge of the Handy Division. This is in addition to his new position as president of Michigan Wire Cloth Co.

Named President

A. A. Bull

A. C. BRYAN has recently been named president, Durston Gear Corp., Syracuse, N. Y. Formerly he was vice president and general manager of the company.

JOSEPH GESCHELIN, Detroit editor, Chilton Publications and 1942 vice president of the SAE Production Activity, will address the Annual Meeting of the Rock River Valley Engineering Council, Rockford, Ill., on Feb. 5.

WILLIAM VANN was recently advanced from chief inspector to assistant plant manager, Pontiac Motor Division, General Motors Corp., Pontiac, Mich.

A. ERIC CONANT WALTON-BALL, formerly in the New Project Production and Design Department, Crouse-Hinds Co. of Canada, Ltd., Ont., now is assistant engineer on design and production, Merrickville Engineering Co., Merrickville, Ont., Canada.

MELVIN N. LEFLER has been named design checker, Lockheed Aircraft Corp., Burbank, Calif. Formerly he was a design engineer, C. F. Braun & Co., Alhambra, Calif.

BERT E. FRAADE has been advanced from experimental engine tester to test engineer, Wright Aeronautical Corp., Paterson, N. J.

JAMES D. MOONEY, vice president and a director of General Motors Corp., has been ordered into active service of the U. S. Navy as of Jan. 1, 1942. There he heads the newly-organized Production Engineering Section in the Production Branch of the Bureau of Aeronautics. Mr. Mooney has been a Lieutenant-Commander in the U. S. Naval Reserve since 1937.

During World War I, Mr. Mooney served in France as a Captain of the 309th Ammunition Regiment, 84th Division. He is a director of the Navy League of the United States, an honorary member of the Marine Society of New York, and belongs to the Quentin Roosevelt Post of the American Legion at Oyster Bay, L. I., N. Y.

Mr. Mooney has been actively identified with the management of General Motors Corp. and its affiliated companies for many years. In 1920, he became president and general manager of the Remy Electric Co.; in 1921, general manager of the General Motors Export Co.; in 1922, vice president of General Motors Corp. in charge of Overseas Operations, and president of General Motors Export Co.; in 1923, a director of General Motors Corp., and in 1935 a member of the Executive Committee, since superseded by the Administration Committee.

James D. Mooney

Mr. Mooney was relieved of his Overseas responsibilities on June 18, 1940, and given an emergency assignment as executive assistant to the president, in full charge of all negotiations involving national defense equipment and of the liaison activities necessary in connection with the engineering and production of this equipment. Soon afterward, he was named chairman of the Defense Materials Relationships Committee, a subgroup of the important Policy Committee of the corporation.

ERNEST L. BASS, formerly chief engineer, Aviation Department, Asiatic Petroleum Co., Ltd., London, is now with the British Air Commission, Washington, D. C.

H. T. WOOLSON, executive engineer, Chrysler Corp., was re-elected vice chairman of the Engineers' Council for Professional Development.

ROBERT B. BURTON, who was formerly employed in the engineering department, Cadillac Motor Car Division, General Motors Corp., Detroit, has been named designing engineer, product study, Automotive Ordnance, with GM.

NORMAN R. NESS is now sales engineer, Minneapolis Moline Power Implement Co., Minneapolis. Formerly he was assistant chief engineer, Tractor Division, with the same company.

L. E. WETZLER recently left Hercules Motors Corp., Canton, Ohio, where he was diesel engineer, Design, to become engineer, The Buda Co., Harvey, Ill.

C. M. Kaltwasser
Appointed Vice President and General Manager

C. M. KALTWASSER was recently appointed vice president and general manager, Fleetwings, Inc., Bristol, Pa. Formerly he was general manager, Stinson Aircraft Division, Vultee Aircraft, Inc., Wayne, Mich.

ARTHUR C. BATES, who has been assistant professor, Mechanical Engineering, Mechanical Engineering Department, University of Pennsylvania, Philadelphia, recently joined the faculty of Lehigh University, Bethlehem, Pa., in a similar capacity.

Five SAE members participated in the Dec. 17 meeting of the Institute of the Aeronautical Sciences at the Pupin Physics Laboratories, Columbia University. **C. R. FAIREY,** past president, Royal Aeronautical Society of Great Britain and Controller of Planning and Production, British Air Commission, Washington, D. C., was an honorary chairman; **PROF. J. C. HUNSAKER,** chairman, National Advisory Committee for Aeronautics and head of the Mechanical Engineering Department, Massachusetts Institute of Technology, was chairman; **DR. GEORGE W. LEWIS,** director of aeronautical research, National Advisory Committee for Aeronautics, and **T. P. WRIGHT,** assistant chief, Aircraft Section, OPM, were two of four discussers of the Lecture; and **FRANK W. CALDWELL,** director of research, United Aircraft Corp. and president of the IAS, was toastmaster at the dinner given in honor of Richard V. Southwell, Professor of Engineering Science, Oxford University, England, who delivered the Lecture. Prof. Southwell spoke on "New Pathways in Aeronautical Theory."

BERNARD LAST recently left Breeze Corporations, Inc., Newark, where he was tool draftsman, to become gear engineer, Ranger Aircraft Engines, Division Fairchild Engine & Airplane Corp., Farmingdale, L. I., N. Y.

CARL EDWARD MURRAY, formerly dynamometer operator, Caterpillar Tractor Co., San Leandro, Calif., was recently named experimental test engineer, Hall Scott Motor Car Co., Berkeley, Calif.

RANDALL BARTON has been named assistant secretary, Fletcher Aviation Corp., Pasadena, Calif. Formerly he was a mechanic, experimental engineering, General Motors Truck & Coach Division of Yellow Truck & Coach Mfg. Co., Pontiac, Mich.

A. VANCE HOWE is now manager of Manufacturers Sales, Bendix-Westinghouse Automotive Air Brake Co. Mr. Howe's headquarters are at Elyria, Ohio. Previously, he was Detroit district manager.

GEORGE L. ROTH recently left Arms-Franklin Corp., Franklin, Pa., where he was vice president, to go with White-Roth Machine Corp., Lorain, Ohio, in a similar capacity.

EDWARD WILLIAM MURPHY recently was named district maintenance supervisor, Civil Aeronautics Administration, Albuquerque, N. M. Formerly he was engineer, Transportes Aereos Centro-Americanos, Honduras, Central America.

Triplex Oil Refining Co., Inc., recently announced the appointment of **A. M. CRITTENDEN** as chemical engineer, with headquarters at the refinery in Long Island City, N. Y. Mr. Crittenden was formerly connected with the Freedom Oil Co., Freedom, Pa., as chief chemist.

WOLDEMAR G. SCHULTZ is now technical consultant, Division of Contract Distribution, OPM, Washington, D. C. Formerly

Woldemar G. Schultz
OPM Technical Consultant

he was experimental engineer, Fisher Body Detroit Division, General Motors Corp.

HARLAND E. JACOBUS, who has been engineer, Aircraft Pump Department, now is assistant aircraft accessories engineer, Thompson Products, Inc., Cleveland.

D. BLIGH GRASETT, formerly manager, Crane Packing Co., Winnetka, Ill., now holds a similar position with the Felt Products Mfg. Co., Chicago.

EUGENE JOSEPH LOURIE recently left the Engineering Department, Vega Airplane Co., Burbank, Calif., to become project engineer, Aviation Engine Division, Chevrolet Motor Co., Buffalo.

RANDOLPH F. HALL is now employed as an aeronautical engineer, Bell Aircraft Corp., Buffalo. Formerly he was chief engineer, Cunningham-Hall Aircraft Corp., Rochester, N. Y.

GEORGE MUELLER, JR., recently left the American Locomotive Co. to join the staff of the Hooven, Owens, Rentschler Division, General Machinery Corp., Hamilton, Ohio.

E. B. DOUGLAS recently joined the staff of the Curtiss Propeller Division, Curtiss-Wright Corp., Caldwell, N. J. He was formerly resident engineer, Johns-Manville Corp., Manville, N. J.

O. G. BLOCHER recently was promoted from chief draftsman to executive engineer, Stinson Aircraft Division, Vultee Aircraft, Inc., Wayne, Mich.

CEYLON ROUSE recently became a technical student, Wright Aeronautical Corp., in Cincinnati. Formerly he was an experimental engineer, Bendix Products, Division of Bendix Aviation Corp., South Bend, Ind.

ANSEL N. MORTON recently was advanced from factory superintendent to factory manager, International-Plainfield Motor Co., Plainfield, N. J.

JOSEPH L. ORLOWSKI, formerly installation engineer, Atlas Imperial Diesel Engine Co., New Bedford, Mass., is now assistant engineering aide (mechanical), at the U. S. Naval Engineering Experiment Station, Annapolis.

BURTON W. ELGIN, formerly national account representative, Firestone Tire & Rubber Co., New York, is now with Firestone Steel Products Co., Detroit, a subsidiary. He is a manufacturer's sales representative working with the car and truck manufacturers, and with tank manufacturers who are building ordnance combat vehicles.

G. HAROLD ALDRICH, formerly junior tool engineer, Reeves Pulley Co., Columbus, Ind., was recently named tool designer, Merz Engineering Co., Indianapolis. The company makes tools, gages, jigs, fixtures, and special machinery.

EARL GOETSCH recently was placed with the Drive-All Mfg. Co., Detroit, as junior designing engineer. The organization specializes in motorizing machinery.

F. M. YOUNG, president and founder of Young Radiator Co., Racine, Wis., recently was elected an honorary member of Alpha Chapter of Pi Tau Sigma, honorary mechanical fraternity, at a formal initiation ceremony and banquet held at Memorial Union Building, University of Wisconsin.

Mr. Young was honored by the fraternity in recognition of having "done much to advance the profession and to encourage young men to do likewise." Each year the fraternity chapter selects one or two outstanding mechanical engineers who have, in addition to the above qualifications, also "attained the goal to which they aspire."

F. M. Young

Mr. Young is a past vice president of the SAE, and has long been active in Society affairs.

WILLIAM KILBY FENTRESS, JR., has been made design engineer, Westinghouse Electric & Mfg. Co., Philadelphia. Formerly he was mechanical engineer, Technical and Research Division, The Texas Co., Beacon, N. Y.

JAMES W. HUGHES, formerly in charge of design, Special Testing Machinery, Chrysler Corp., Highland Park, Mich., recently retired from active business.

Edgard C. DeSmet Made Chief Body Engineer

EDGARD C. DeSMET has been named chief body engineer, Willys-Overland Motors, Inc., Toledo, Ohio. Formerly he was assistant chief engineer.

JAMES C. M. YOU, formerly University of Michigan student and more recently connected with the garage of the Greyhound Terminal, Detroit, is now in Washington, D. C., where he is studying Motor Traffic under the direction of the commissioner, U. S. Public Road Administration, Federal Works Agency.

ROBERT ADRIAN OHLBAUM was recently advanced from instrument inspector to junior engineer, Sperry Gyroscope Co., Inc., Brooklyn.

★★★★★★★★★★★★★★★★★★★★★★★★★

In Military Services

LT.-COL. EDWIN A. SMITH is Armored Force representative, U. S. Army, at the 3rd Air Support Command, Savannah Air Base, Savannah, Ga. Prior to this assignment he was attached to the 40th Armored Regiment (medium tanks), 3rd Armored Division, Camp Polk, La.

HARVEY MORTON CRONK was recently promoted from Captain to Major, U. S. Army Air Corps. He is chief, Army and Navy Aeronautical Specification Branch, Product Engineering Section, Wright Field, Dayton, Ohio.

ROBERT H. REID has been advanced from Captain to Major, U. S. Army, 13th Ordnance Company, 6th Division, Chicago.

JAMES B. MISNER, who was a standards engineer, Hughes Aircraft Co., Venice, Calif., is now on active duty with the U. S. Army Air Corps, as property and supply officer, Air Service Command, Santa Monica, Calif.

Former Purdue University student **ROLUND F. DeHOOG** is now a 2nd Lieutenant, Field Artillery, U. S. Army, 2nd Battalion, 1st Regiment, Field Artillery Reserve Corps, Fort Bragg, N. C.

★★★★★★★★★★★★★★★★★★★★★★★★★

HAROLD CAMINEZ was recently named engineer, Lycoming Division, Aviation Mfg. Co., Williamsport, Pa. Formerly he was executive engineer, Air Associates, Inc., Bendix, N. J.

KENDALL PERKINS, formerly in charge of the Airplane Program, Unit Aircraft Branch, OPM, Washington, D. C., now is project engineer, McDonnell Aircraft Corp., Robertson, Mo.

Promotion of **STANLEY MARKLAND,** from research engineer to assistant chief engineer, Leyland Motors, Ltd., Leyland, England, was announced recently.

Beginning Jan. 1, 1942, **KENNETH I. BIRD** will be in charge of the Production Test Department, Pratt & Whitney Aircraft Division, United Aircraft Corp., East Hartford, Conn. Formerly he was foreman, Inspection, Assembly and Test, with the same company.

SIDNEY GLASS, who was layout draftsman, Lockheed Aircraft Corp., Burbank, Calif., was recently named salvage engineer, with the same company.

MAURICE PLATT succeeded Alex Taub as power unit engineer, Vauxhall Motors, Ltd., England, when the latter came to this country on a special assignment at the end of 1940. Mr. Platt was formerly sales and service contact engineer with the company, and from the outbreak of the war

Maurice Platt Power Unit Engineer

until Mr. Taub left Vauxhall, he worked with the latter on Vauxhall-Bedford engine design and development. Previously Mr. Platt was technical editor of the British publication *Motor*.

W. O. BISCHOFF, formerly assistant chief draftsman, Ranger Aircraft Engines Division, Fairchild Engine Corp., Farmingdale, L. I., N. Y., now is designer, American Bosch Corp., Springfield, Mass.

GEORGE W. MEGRATH, formerly mechanic, Carroll's Service, Brookline, Mass., now is a gear cutter, General Electric Co., Schenectady, employed in defense work.

Cooper Union graduate **ABRAHAM STERN** is now employed as a test engineer by the U. S. Army Air Corps, and is stationed at Detroit.

ABE L. DORFMAN, former Cooper Union student, now is senior engineering draftsman, War Department, Ordnance Department at Large, Picatinny Arsenal, Dover, N. J.

Named Assistant General Manager

Alva W. Phelps

ALVA W. PHELPS, formerly general manager, Saginaw Steering Gear Division, General Motors Corp., Saginaw, Mich., was recently named assistant general manager, Electro-Motive Corp., LaGrange, Ill., another General Motors subsidiary. During his six-year tenure of office he aided in the development of new products introduced by the Division, and obtained for the Division government defense contracts for making machine guns, which it is now engaged in filling.

SAE members who participated in the Canadian Motor Freight Carriers Convention, held Nov. 28-29, in the Royal York Hotel, Toronto, Canada, included: **FREDERICK C. HORNER,** assistant to the chairman, General Motors Corp., who gave a speech entitled, "Truck Transportation in England under Fire—A Lesson for Us;" **R. C. BERKINSHAW,** director general of priorities, Canadian Department of Munitions and Supply and chairman of the Wartime Industries Control Board; **FRED B. LAUTZENHISER,** chief transportation engineer, International Harvester Co., Chicago, who discussed "Motor-Vehicle Load Distribution Factors"; **R. G. RILEY,** sales and service engineer, Thompson Products, Inc., Cleveland, who talked on "Super Engines and Their Relation to Modern Trucking;" and **C. R. OLSON,** operations and safety manager, Inter-State Motor

(*Concluded on following page*)

Harry D. Bubb, Jr.

Mr. Bubb recently was promoted from chief engineer of the Cleveland plant, Thompson Products, Inc., to director of engineering for both the Cleveland plant and Thompson Aircraft Products Co., a subsidiary in Euclid, Ohio.

Freight Systems, Detroit, who covered "Employee-Employer Relations."

The Convention was sponsored by the Canadian Automotive Transportation Associations.

A. T. COLWELL, vice president, Thompson Products, Inc., and SAE president, talked before the National Standard Parts Association in Chicago, Dec. 15, on "Mechanization in the Defense Program and How It Affects Your Business." On Feb. 12, he is scheduled to address the Columbus Chapter of the American Society of Tool Engineers.

STEPHEN G. HENRY has been advanced from Lieutenant-Colonel to Brigadier-General, U. S. Army, Armored Force School, Fort Knox, Ky.

VAUGHN HAIGH, formerly analytical engineer, Warner Gear Division, Borg-Warner Corp., Muncie, Ind., recently joined Studebaker Corp., South Bend, as transmission engineer.

ROBERT J. HUTCHINSON, who was in the Engineering Department, Kenworth Motor Truck Corp., Seattle, Wash., is now superintendent of operations, Seaboard Transportation Co., Stockton, Calif.

HAROLD A. NISLEY, formerly Major, U. S. Army, and assistant professor in charge of the Ordnance Unit, Reserve Officers Training Corps, Massachusetts Institute of Technology, Cambridge, is now a Lieutenant-Colonel, and ordnance officer of the armored force, Headquarters Armored Force, Fort Knox, Ky.

H. B. HOBSON recently was named supply officer, Motor Transport, with the British Purchasing Commission, Washington, D. C. Previously, he was head of the Float Division, B. H. Aircraft Co., Long Island City, N. Y.

S. E. ELLERBE recently severed his connections as sales and test engineer, Sinclair Refining Co., Atlanta, Ga., and is now fleet engineer in the Atlanta Division, Ethyl Gasoline Corp. In this position he will be in charge of all automotive work in the Atlanta Division, and will collaborate with equipment builders and oil companies in the solving of their mutual problems.

Present position of **EDWARD STUART RUSSELL** is leadman of fuselage jig design, Vega Airplane Co., Burbank, Calif. Formerly he was tool designer with the same company.

W. W. KADOW now is employed as a production engineer in a civilian capacity, U. S. Army, Signal Section, San Francisco General Depot, Fort Mason. Formerly he was a salesman, White Motor Co., Los Angeles.

HALL L. HIBBARD, vice president and chief engineer, Lockheed Aircraft Corp., Burbank, Calif., recently was elected president of the Institute of the Aeronautical Sciences for the year 1942. He succeeds **FRANK W. CALDWELL,** director of research, United Aircraft Corp., East Hartford, Conn.

Responsible for the design of a long series of Lockheed airplanes which are noted for their speed and military excellence, Mr. Hibbard helped in pioneering the development of the twin tail airplane. His designs have used increasingly heavy wing loadings and include an experimental tail-first or canard type of airplane. In the development of air transport types and the Army's famous stratosphere airplane, his work has been outstanding.

Born in Fredonia, Kan., Mr. Hibbard spent his boyhood in the Philippine Islands, where his father was a missionary for 41 years. Upon graduating from the College of Emporia, he took a post graduate course in aeronautics at the Massachusetts Institute of Technology and received an M. A. degree in aeronautical engineering in 1927. He became chief engineer of the Lockheed company five years later, having been on the engineering staff of the Stearman Aircraft Co. in the interim.

L. S. SHELDRICK, engineer, Ford Motor Co., and **D. G. ROOS,** vice president and chief engineer, Willys-Overland Motors, Inc., recently were appointed members of the SAE Ordnance Advisory Committee.

DR. SIDNEY M. CADWELL, director of tire development, U. S. Rubber Co., recently was named alternate for **DR. C. M. SLOMAN** on the Rubber Products Subcommittee of the SAE Ordnance Advisory Committee, replacing W. R. Yaw.

Election of **DR. PER K. FROLICH** to presidency of the American Chemical Society for 1943, was announced recently. Dr. Frolich is director of the Chemical Division, Esso Laboratories, Standard Oil Development Co. Elizabeth, N. J. He will take office as president-elect on Jan. 1, 1942. Dr. Frolich was awarded the Grasselli Medal in 1930 for outstanding achievement in chemistry, particularly in the field of high-pressure reaction of gases. In addition Dr. Frolich is well known for contributions to the development of synthetic rubbers and for work on the transformation and chemical utilization of hydrocarbons and in applied colloid chemistry.

Defense Progress

(*Continued from p. 32*)

Seven of these are turning out tanks, and Ford and General Motors are undertaking a huge additional capacity of these land battleships. The old program called for the building of 2800 tanks by the end of 1942, a figure already revised upward.

Some of the earlier delays in arms production were laid to the inability to get machine tools designed and built in time. A number of dramatic instances of conversion are known to OPM officials, and it appears that many large manufacturing companies will turn a major part of their tool room facilities to building machine tools and equipment to carry a part of this load. Already some automotive companies have done so, and more will be pressed to follow suit. Normal U. S. machine tool production has been about 25,000 units a year. This has been upped to 100,000 in 1940, and 200,000 in 1941. The pre-Pearl Harbor estimate was a machine tool bill of $1,200,000,000 for 1942, nearly double that of 1941. Already some OPM officials are talking about upping this schedule, and in some cases working out in detail plans with machine tool builders to achieve this goal.

Victory-Grams

BOFORS ANTI-AIRCRAFT GUN AS REDESIGNED BY CHRYSLER ENGINEERS TO PERMIT MASS PRODUCTION, IS IMPROVEMENT OVER EUROPEAN MAKES, YET MACHINING AND ASSEMBLY TIME WAS REDUCED ON 100 OF ITS 500 PARTS. MOST OF CHRYSLER'S AUTO PLANTS PARTICIPATE IN MAKING PARTS, AND 400 OF THE 1400 MACHINE TOOLS WERE TAKEN FROM AUTOMOBILE PRODUCTION LINES.

★

NEW ENGLAND NEARS FINISH OF NATIONAL TRUCK-BUS INVENTORY, BUT SOUTHERN STATES ARE SLOW.

★

ARMY'S FIVE ARMORED DIVISIONS WILL BE REORGANIZED TO PROVIDE FOR MORE MEDIUM TANKS, AUTOMOTIVE ARTILLERY, ARMORED CARS.

★

$5 MILLION FOR "FLIGHT STRIPS" FOR EMERGENCY AIR-CORPS LANDINGS SEEN BY HIGHWAY EXPERTS AS A TRIAL VENTURE; ALL EARLY STRIPS WILL BE EXPERIMENTAL, AND APPROPRIATION IS MUCH TOO SMALL TO SERVE ITS PURPOSE.

★

"AUTOMOTIVE INDUSTRY ACCEPTS WITHOUT QUESTION ADDITIONAL CURTAILMENT (AUTOMOBILES & LIGHT TRUCKS) . . ." SAID ALVAN MACAULEY, PRESIDENT OF AMA, CITING HUGE TASK ALREADY UNDERTAKEN BY CAR MAKERS.

★

BRITISH TRAFFIC FATALITIES, ALMOST TREBLED DURING WAR, ARE CAUSED BY: HEAVIER TRAFFIC, FASTER DRIVING, IGNORING SAFETY RULES, FEWER TRAFFIC COPS, POOR CONDITION OF CARS, AND THE BLACKOUTS DURING AIR RAIDS.

★

A COMPANY RECENTLY WIRED DONALD M. NELSON, OPM DIRECTOR OF PRIORITIES . . . "NATIONAL EMERGENCY IS NO TIME TO BE ASKING US FOR REPORTS . . ." WIRED NELSON: "YOUR REFUSAL IS UNWARRANTED AND HAS IMPEDED PROPER ADMINISTRATION OF THE PRIORITIES SYSTEM," AND ORDERED THE REPORT IMMEDIATELY

★

MORE THAN $1 MILLION WORTH OF SCARCE MATERIALS IN WAREHOUSES AND SHIPPING TERMINALS WERE SEIZED UNDER PRESIDENT'S ORDER (NOV. 19). MATERIALS WERE LOCATED BY OPM SURVEY, FOUND TO BE OWNED BY FOREIGN FIRMS WHO WILL BE COMPENSATED.

APPLICATIONS Received

The applications for membership received between Nov. 15, 1941, and Dec. 15, 1941, are listed below. The members of the Society are urged to send any pertinent information with regard to those listed which the Council should have for consideration prior to their election. It is requested that such communications from members be sent promptly.

Baltimore Section

Altseimer, John H., draftsman, Glenn L. Martin Co., Baltimore.

Wasem, James E., Jr., junior engineer, U. S. Army, Ordnance Department, Aberdeen Proving Ground, Md.

Buffalo Section

Brennan, Richard G., weight engineer, Airplane Division, Curtiss-Wright Corp., Buffalo Airport Plant, Buffalo.

Duke, William Meng, structural engineer, Airplane Division, Curtiss-Wright Corp., Buffalo.

Haynes, Alex L., engineer, Airplane Division, Curtiss-Wright Corp., Buffalo.

Heuss, Leon A., engineer, Airplane Division, Curtiss-Wright Corp., Buffalo.

Kalish, David, layout draftsman, Airplane Division, Curtiss-Wright Corp., Buffalo.

Koegler, Richard K., project structural engineer, Airplane Division, Curtiss-Wright Corp., Buffalo.

Krivetsky, Alexander, structural engineer, Airplane Division, Curtiss-Wright Corp., Buffalo.

Secord, Charles Robert, production design draftsman, Airplane Division, Curtiss-Wright Corp., Buffalo.

Sepanske, Medard J., engineer, Airplane Division, Curtiss-Wright Corp., Buffalo.

Shaffer, Leonard, weight engineer, Airplane Division, Curtiss-Wright Corp., Buffalo.

Strauss, Harold H., structural engineer, Airplane Division, Curtiss-Wright Corp., Buffalo.

Welty, John W., process engineer, Bell Aircraft Corp., Buffalo.

Canadian Section

Braithwaite, Kenneth H., works manager, Duplate Canada Ltd., Oshawa, Ont.

Dawson, William, general manager, Brantford Coach & Body, Ltd., Brantford, Ont.

Gelb, Hans, chief engineer, Research Enterprises, Ltd., Leaside, Ont.

Chicago Section

Bell, Richard James, test house engineer, Bendix Aviation Corp., South Bend, Ind.

Droegemueller, Edwin A., research engineer, Standard Oil Co. of Ind., Whiting, Ind.

Ferguson, Donald B., special representative, Studebaker Sales Corp. of America, Chicago.

Haase, Elmer August, experimental engineer, Bendix Aviation Corp., South Bend, Ind.

Harley, J. W., Jr., engineering representative, Bendix Products Division, Bendix Aviation Corp., South Bend, Ind.

Huber, Max N., project engineer, Bendix Products Division, Bendix Aviation Corp., South Bend, Ind.

Keller, E. G., carburetor controls engineer, Bendix Products Division, Bendix Aviation Corp., South Bend, Ind.

Kirwin, James M., engineer, Bendix Products Division, Bendix Aviation Corp., South Bend, Ind.

Liddy, Arthur C., principal instructor, skilled trades, automotive, U. S. Army, Quartermaster Corps, Fort Sheridan, Ill.

Malick, Emil, research and experimental engineer, Bendix-Stromberg Carburetor Division, Bendix Aviation Corp., South Bend, Ind.

Manhart, Charles D., sales manager, Bendix Products Division, Bendix Aviation Corp., South Bend, Ind.

McQuiston, W. H., experimental engineer, Bendix Products Division, Bendix Aviation Corp., South Bend, Ind.

Moore, Richard, assistant aircraft engineer, Sinclair Refining Co., East Chicago, Ind.

Nichols, Allen A., foreman, experimental laboratory, Bendix Aviation Corp., South Bend, Ind.

Suttle, W. C., project engineer, Bendix Aviation Corp., South Bend, Ind.

Thomas, T. H., acting chief engineer, Bendix Products Division, Bendix Aviation Corp., South Bend, Ind.

Thompson, Albert L., representative at Studebaker Corp., Bendix Products Division, Bendix Aviation Corp., South Bend, Ind.

Weber, Clinton L., project engineer, Bendix Aviation Corp., South Bend, Ind.

Williams, Howard Johnson, research engineer, Bendix Products Division, Bendix Aviation Corp., South Bend, Ind.

Wiseman, R. Bruce, junior designer, The Buda Co., Harvey, Ill.

Yeoman, William D., junior engineer, Bendix Products Division, Bendix Aviation Corp., South Bend, Ind.

Cleveland Section

Gray, Harold, technical superintendent, tire department, B. F. Goodrich Co., Akron, Ohio.

Guth, Elmer P., draftsman, White Motor Co., Cleveland.

Hartz, John J., engineer, Goodyear Tire & Rubber Co., Akron, Ohio.

Reid, James S., president, Standard Products Co., Cleveland.

Schwartz, W. H., chief engineer, Lester Engineering Co., Cleveland.

Van Epps, John N., engineer, Thompson Products, Inc., Cleveland.

Dayton Section

McCauley, Ernest G., president and chief engineer, McCauley Steel Propeller Co., Dayton.

Schlub, Carl F., junior mechanical engineer, U. S. Army, War Department, Air Corps, Wright Field, Dayton.

Detroit Section

Casenhiser, Edwin O., inspection supervisor, installation and final assembly, aircraft division, Murray Corp. of America, Detroit.

Chesebrough, Harry Elmer, experimental engineer, Chrysler Corp., Highland Park, Mich.

Cowgill, Wilmer D., salesman, Cleveland Graphite Bronze Co., Detroit.

Doerfner, William H., general manager, Saginaw Steering Gear Division, General Motors Corp., Saginaw, Mich.

Ehrlich, Waldemar, draftsman, Packard Motor Car Co., Detroit.

Harkonen, R. L., draftsman, Wilcox-Rich Division, Eaton Mfg. Co., Detroit.

Hillcoat, Alex, resident engineer, Chevrolet Gear & Axle Division, General Motors Corp., Detroit.

Hulswit, William H., physicist, U. S. Rubber Co., Detroit.

Little, David Jennings, design engineer, Livermore Corp., Detroit.

McCarroll, Russell Hudson, in charge of chemical and metallurgical engineering, Ford Motor Co., Dearborn, Mich.

Miller, Orville V., sales engineer, P. R. Mallory & Co., Inc., Indianapolis, Ind. Mail: 3026 East Grand Blvd., Detroit.

Miller, Stuart P., sales engineer, E. I. du Pont de Nemours & Co., Detroit.

Nimrick, Harold C., production engineer, Packard Motor Car Co., Detroit.

Ritts, George Paul, chassis engineer, Olds Motor Works Division, General Motors Corp., Lansing, Mich.

Shields, James Joseph, aircraft engine design, Continental Aviation & Engineering Corp., Detroit.

Straughn, Robert W., sales engineer, Amplex Division, Chrysler Corp., Detroit.

Tracy, Frederick F., junior mechanical engineer, U. S. Army, Air Corps, Materiel Division, Wright Field, Dayton, Ohio. Mail: 7941 Agnes St., Detroit.

Wassman, Henry Fredric, drafting room leader, Ford Motor Co., Dearborn, Mich.

Weldy, R. K., mechanical engineer, diesel division, Ex-Cell-O Corp., Detroit.

Wellington, Roger D., project engineer, Detroit Diesel Engine Division, General Motors Corp., Detroit.

Zimmerman, John, project engineer, Continental Aviation & Engineering Corp., Detroit.

Indiana Section

Tresselt, A. R., Jr., mechanical engineer, Cummins Engine Co., Columbus, Ind.

Metropolitan Section

Black, William C., engineer, Adam Black & Sons, Inc., Jersey City, N. J.

Curth, A. O., assistant vice president, general manager, Universal Cartage Co., New York City.

Cutler, Roswell E., senior test engineer, Wright Aeronautical Corp., Paterson, N. J.

Epps, Max, fuel and lubricant engineering, Ranger Aircraft Engines, division of Fairchild Engineering & Aircraft Corp., Farmingdale, L. I., N. Y.

Gilbert, Milton C., service manager, Harcourt Motor Co., Newburgh, N. Y.

Griffiths, Robert Hall, technical records clerk, Wright Aeronautical Corp., Paterson, N. J.

Klein, Frank Dunne, sales engineer, Standard Oil Co. of N. J., New York City.

Knapp, George P., assistant project engineer, Propeller Division, Curtiss-Wright Corp., Caldwell, N. J.

McManus, Richard O., junior test engineer, Eclipse Aviation, division of Bendix Aviation Corp., Bendix, N. J.

Perrino, Robert R., service manager, National Transportation Co., New York City.

Petre, William J., draftsman, Ranger Aircraft Engines, division of Fairchild Engineering & Aircraft Corp., Farmingdale, L. I., N. Y.

Walsh, Ralph E., draftsman, tool designer, Breeze Corporations, Inc., Newark, N. J.

Milwaukee Section

Nau, Paul R., assistant experimental engineer, Wisconsin Motor Corp., West Allis, Wis.

Thomas, Dean G., research engineer, Nelson Muffler Corp., Stoughton, Wis.

New England Section

Clark, Arthur W., service manager, General Motors Truck & Coach Division, Yellow Truck & Coach Mfg. Co., Boston.

Malone, James W., guarantee engineer, diesel engine division, American Locomotive Co., Auburn, N. Y. Mail: Building 81, Navy Yard, Portsmouth, N. H.

Morris, Charles W., sales engineer, General Electric Co., Lynn, Mass.

Oregon Section

Tretton, James Patrick, Jr., superintendent of equipment, Portland Traction Co., Portland, Oregon.

Philadelphia Section

Griesemer, Henry J., experimental engineer, Wilkening Mfg. Co., Philadelphia.

Towle, Joseph H., sales engineer, Towle & Son Co., Philadelphia.

Pittsburgh Section

Dolan, Edward J., sales engineer, Bendix-Westinghouse Automotive Air Brake Co., Pittsburgh.

Kittredge, W. J., Jr., fleet sales representative, General Motors Truck & Coach Division, Yellow Truck & Coach Mfg. Co., Pontiac, Mich. Mail: 3701 Liberty Ave., Pittsburgh.

Prickett, O. C., commercial salesman, Firestone Tire & Rubber Co., Pittsburgh.

Southern California Section

Clark, John M., Jr., test engineer, Douglas Aircraft Co., Inc., Santa Monica, Calif.

Hawkins, Douglas F., designing, Peerless Pump Co., Los Angeles

Howard, Thomas D., sales engineering, International Harvester Co., Los Angeles.

Hunter, Harry, chief engineer, Truck Insurance Exchange, Los Angeles.

Reichlin, Felix C., diesel engine designer, Menasco Mfg. Co., Burbank, Calif.

Reynolds, Harry V., president, Pacific Aviation, Inc., Los Angeles.

Smith, Preston G., assistant power plant engineer, Douglas Aircraft Co., Inc., El Segundo, Calif.

Stinson, Edgar Douglas, Jr., truck mechanic, International Harvester Co., Los Angeles.

Waugh, John Dean, instructor in propellers, Curtiss-Wright Technical Institute, Glendale, Calif.

Southern New England Section

Hahn, Frank J., test engineer, Pratt & Whitney Aircraft, division of United Aircraft Corp., East Hartford, Conn.

Higgins, Ralph W., service representative, United Aircraft Service Corp., East Hartford, Conn.

Muir, George F., development engineer, Fuller Brush Co., Hartford, Conn.

Traylor, John E., experimental test engineer, Pratt & Whitney Aircraft, division of United Aircraft Corp., East Hartford, Conn.

Tulsa Group

Helm. Elbert D., lubrication plant superintendent, Texas Pacific Coach & Oil Co., Fort Worth, Texas.

Washington Section

Heddings, L. Wilson, service manager, White Motor Co., Washington, D. C.

Emtage, E. L. Mayall, deputy assistant director, British Air Commission, Washington, D. C.

Whetzel, Carl S., sales engineer, S. J. Meeks' Son, Washington, D. C.

White, Alton A., manager, Government division, The S. K. Wellman Co., Washington, D. C.

Wood, Harry B., Sr., automotive engineer and spare parts expert, U. S. Army, War Department, Office of Chief of Ordnance, Washington, D. C.

Outside of Section Territory

Berry, Frank, superintendent and design engineer, W. T. Adams Machine Co., Inc., Corinth, Miss.

Blasingame, R. U., head, agricultural engineering department, Pennsylvania State College, State College, Pa.

Enblom, John C., assistant chief engineer, Donaldson Co., Inc., St. Paul, Minn.

Garrett, Thomas R., president, The Universal Motor Oils Co., Inc., Wichita, Kansas.

Johnston, William Henry, S/Sgt., instructor, propellers, U. S. Army, Air Corps, Air Corps Technical School, Rantoul, Ill.

Larinoff, Michael W., design engineer, J. I. Case Co., Rock Island, Ill.

Munsell, Judson D., Jr., field lubrication engineer, Kendall Refining Co., Bradford, Pa.

Riegel, G. C., chief metallurgist, Caterpiller Tractor Co., Peoria, Ill.

Staley, K. E., zone manager, Chevrolet Motor Division, General Motors Corp., Omaha, Neb.

Foreign

Dixon, Cecil George, technical assistant, General Motors South African, Ltd., Port Elizabeth, S. A.

NEW MEMBERS Qualified

These applicants who have qualified for admission to the Society have been welcomed into membership between Nov. 15, 1941, and Dec. 15, 1941.

The various grades of membership are indicated by: (M) Member; (A) Associate Member; (J) Junior; (Aff.) Affiliate Member; (SM) Service Member; (FM) Foreign Member.

Chicago Section

Dunn, William John (A) sales manager, Hydraulic Controls, Inc., 122 S. Michigan Ave., Chicago.

Finch, Kenneth W. (J) engineer, research department, Studebaker Corp., South Bend, Ind. (mail) 2435 Bonds Ave.

Gerstung, Harry S. (J) assistant project engineer, Sinclair Refining Co., East Chicago, Ind. (mail) 54 Warren St., Hammond, Ind.

McRoberts, James C. (M) project engineer, Radial Diesel Engine Division, Buda Co., Harvey, Ill. (mail) 6437 S. Kimbark Ave., Chicago.

Polko, Peter Paul (J) designing engineer, International Harvester Co., Gas Power Engineering Department, Chicago (mail) 4342 S. Oak Ave., Lyons, Ill.

Cleveland Section

Anderson, J. Edward C. (J) design of fabricating equipment, Parker Appliance Co., 17325 Euclid, Cleveland (mail) 2056 Hanover Dr., Cleveland Heights, Ohio.

Feichter, Harold R. (A) production manager, director of research, U. S. Quarry Tile Co., 730 Renkert Bldg., Canton, Ohio (mail) 600 19th St., N. W.

Murray, John Frederick (J) development engineer, Thompson Products, Inc., 2196 Clarkwood Road, Cleveland (mail) 1474 E. 115th St.

Poremba, Joseph August (J) development engineer, Thompson Products, Inc., Cleveland (mail) 1614 Mentor Ave.

Sheflin, Bob W. (J) draftsman, White Motor Co., Cleveland (mail) 10505 Baltic Road.

Detroit Section

Burleigh, Manferd (A) president, Great Lakes Greyhound Lines, Inc., 1407 Washington Blvd., Detroit.

Kriese, George E., Jr. (J) dynamometer tester, Packard Motor Car Co., Detroit (mail) 285 Moross Rd., Grosse Pointe Farms, Mich.

Nakahara, Francis Toshihiko (J) junior engineer, U. S. Army, Air Corps, Materiel Division, Central Procurement District, 8505 W. Warren Ave., Detroit.

Stanley, Rowland I. (A) sales engineer, Perfect Circle Co., 300 S. Washington St., Hagerstown, Ind. (mail) 8-221 General Motors Bldg., Detroit.

Tollzien, Ward C. (A) sales, Spring Perch Co., Inc., Lackawanna, N. Y. (mail) 509 Stephenson Bldg., Detroit.

Indiana Section

Hunter, Leo L., Corporal (J) U. S. Army, Company D, 4th Ordnance Training Battalion, Aberdeen Proving Ground, Md. (mail) 1212 Wea Ave., Lafayette, Ind.

Metropolitan Section

Burgess, Nathaniel D. (J) test engineer, Wright Aeronautical Corp., Paterson, N. J. (mail) Oakwood Dr., Wyckoff, N. J.

Parker, Willard Wood (J) engineer, Curtiss-Wright Corp., Propeller Division, Caldwell, N. J. (mail) 95 Chestnut Dr., Packanack Lake, N. J.

Skarbek, Henry F. J. (M) chief draftsman, Breeze Corporations, Inc., 41 S. Sixth St., Newark, N. J. (mail) 2018 Stecher Ave., Union, N. J.

Milwaukee Section

Wolfe, Myron C. (J) C. F. R. operator, head test man, Waukesha Motor Co., Waukesha, Wis. (mail) 3732 S. Rutland Ave., St. Francis, Wis.

New England Section

Johnson, Wilfrid E. (M) charge of mechanical design, Supercharger Engineering

Volume Numbers Straightened Out

Starting with this January 1942 issue, there will be but one volume number for the SAE Journal each year. (Heretofore there have been two.)

The volume of SAE Transactions to be published shortly covering material published in the Transactions Section of the SAE Journal during 1941 arbitrarily will be designated as Volume 36-49. Thus, from now on, the volume numbers of the SAE Journal will correspond each year with the volume number of Transactions.

The twelve 1942 issues of the SAE Journal will be Volume 50 – the 1942 Transactions will be Volume 50.

Department, General Electric Co., Lynn, Mass. (mail) 24 Glendale Rd., Marblehead, Mass.

Northwest Section

Stein, John P. (A) manager, secretary, treasurer, Dependable Tank Transport, Inc.; Transport Builders Co., Pier 41, Seattle, Wash.

Philadelphia Section

Simpson, Henry A. (M) secretary, treasurer, consulting engineer, Machine & Tool Designing Co., 1011 Chestnut St., Philadelphia.

Southern California Section

Branning, Ralph Ivan, Jr. (J) draftsman, Douglas Aircraft Co., Inc., El Segundo, Calif. (mail) 820 S. Mansfield Ave., No. 302, Los Angeles.

Carr, D. E. (M) manager of research, Union Oil Co., of Calif., P. O. Box 758, Wilmington, Calif.

Chevedden, Ray Thomas (J) junior layout draftsman, Lockheed Aircraft Corp., Burbank, Calif. (mail) 10356 Commerce Ave., Tujunga, Calif.

Heldack, John Martin (J) field engineer, General Electric Co., 920 Western Ave., West Lynn, Mass. (mail) 3721 Lotus Dr., San Diego, Calif.

Southern New England Section

Kopplin, Carl H. (J) experimental test engineer, Pratt & Whitney Aircraft, Division of United Aircraft Corp., East Hartford, Conn. (mail) 95 W. Middle Turnpike, Apt. 12, Manchester, Conn.

Pratt, Robert William (J) experimental test engineer, Pratt & Whitney Aircraft, Division of United Aircraft Corp., East Hartford, Conn. (mail) 54 Chestnut St., Manchester, Conn.

Tulsa Group

McCracken, S. S. (A) service lecturer, Hastings Mfg. Co., Hastings, Mich. (mail) 6042 Wildwood, Dallas, Tex.

Washington Section

Jackson, Charles H. (J) assistant radio engineer, War Department, Office of Chief Signal Officer, Washington (mail) Apt. 202 Randal Mansions, 1900 Lamont St., N. W.

Wichita Section

McAleavey, Frank L. (J) draftsman, Cessna Aircraft Co., Wichita, Kan. (mail) 1158 S. Minneapolis.

Outside of Section Territory

Darling, Charles M., Jr. (A) sole owner, Allegany Oil Co., Union National Bank Bldg., Marquette, Mich.

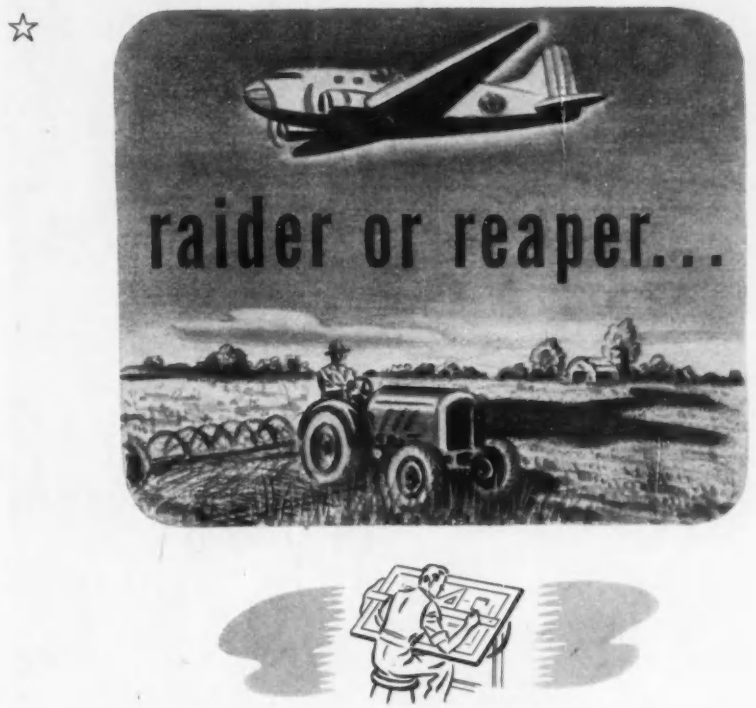
Faust, Nile E. (A) service representative, Chrysler Corp., Service Division, E. Jefferson Plant, Detroit (mail) 246 Woodford St., Portland, Me.

Haselwood, Willis Eads (M) chief engineer, Taylor Sales Engrg. Co., Elkhart, Ind.

Hornibrook, Howard Gordon (A) president, Apex Oil Products Co., 100 17th Ave., N., Minneapolis.

MacKenzie, John M. (J) instructor, general engineering, Bradley Polytechnic Institute, Peoria, Ill.

Musser, Charles William (M) chief engineer, Jubilee Mfg. Co., 1929-39 S. 20th St., Omaha, Neb.



. . it's Arkwright across the board. For draftsmen know that the quality of Arkwright Tracing Cloths never varies. They know that Arkwright standards stand . . in war as well as in peace!

Smoothness of surface, permanent transparency, ability to take erasures without smudging–that's what Arkwright quality has always meant. And that's what it means today . . what it will continue to mean. What's more, delivery is as prompt, as dependable as ever.

Since there are four brands of Arkwright Tracing Cloths, one is bound to be suited to your type of work. So why not write for free samples – and new catalog? Arkwright Finishing Company, Providence, Rhode Island.

Arkwright TRACING CLOTHS

"AMERICA'S OLDEST AND FINEST"

Sold by Leading Drawing Material Dealers Everywhere

News of Society

(*Continued from p. 23*)

Trends in Development and Design of Diesel Engines."

There is a definite need for higher efficiency and lower first-cost diesel superchargers, Mr. Rosen said, adding that air-cooled superchargers would markedly increase their overall efficiency. The two-cycle engine can be expected to give power increases of 70 to 90% over the four-cycle engine depending on the scavenging system used, the engineering audience was told.

Stating that it is not fair to compare the diesel and gasoline engine performance from test stand figures, Mr. Rosen said these engines should be compared by actual service life based on piston and ring deterioration, bearing life, and lubricating oil deterioration.

Piston and ring deterioration has been checked considerably, it was stated, by surface treatment of cylinder liners through an etching process which removes the minute "fish-scale" structure remaining on the surface after honing. This process, furthermore, makes a semi-rough finish which has valuable oil-retaining qualities greatly superior to smooth high-polished surfaces.

Piston rings have less sealing qualities on the explosion stroke than on the compression stroke, Mr. Rosen said in refutation of a general conception. This was proven by electric oscillation tests made by a magnetic pick-up system between the ring side and the piston-ring groove, he stated. To control oil consumption, ring-sticking, blowby, and oxidation, it is of the utmost importance that rings are sealed tight against the cylinder wall, Mr. Rosen said, adding that with the proper set-up three rings should be sufficient even in a diesel engine.

It is Mr. Rosen's test-substantiated opinion that ring-sticking in diesel engines is aggravated by the excess air in the blowby gases. Some diesel-engine designs create blowby gases which contain as high as 90% air, he said, adding that this excess air oxidizes the oil and causes bad sticking conditions.

In closing, Mr. Rosen stated that all engineers are indebted to electronics for the availability of measuring means of high-speed or high-frequency activities. Today, motion picture photography at the rate of 50,000 frames per sec is within our control, he said.

Stimulating discussion on ring-sticking through oxidation followed the paper. The group attacked the problem of whether ring-sticking is caused by oil oxidation sans temperature or whether it was caused by a combination of the two.

BENDIX DRIVE

Approved by

MANUFACTURER
ENGINEER
CAR DEALER
MOTORIST!

THE acceptance of the Bendix Drive by all who make, sell or drive automobiles speaks volumes for the excellence of "the mechanical hand that cranks your car." Their approval, won by its own inherent advantages, has made Bendix Drive one of the world's most widely used automotive components.

Since the first cars were automatically cranked by Bendix Drive, this remarkable invention has performed brilliantly. Adaptable to every type of starting control—floor button, clutch or accelerator pedal, dash button or, with Startix, completely automatic switch-key starting—the Bendix Drive unfailingly starts millions of motors every day throughout the year.

There's a Bendix Drive for every size and type of automobile, marine or Diesel engine. Renewal parts and complete replacement drives are available in every civilized country. In addition, a liberal Exchange Plan serves the convenience of motorists and dealers throughout the United States.

ECLIPSE MACHINE DIVISION
BENDIX AVIATION CORPORATION
ELMIRA, NEW YORK

"Inside Story of Oil" Film Draws Year's Best Discussion

■ *Indiana*

The most lively discussion the Indiana Section has experienced this year resulted when a substitute discusser jumped into the breach at the last minute for H. A. Frommelt, director of research, Kearney & Trecker, Milwaukee, who was unable to attend the Nov. 6 meeting when the plane he was preparing to board in Rochester, N. Y., was grounded due to bad weather. Mr. Frommelt was scheduled to speak on "Plastics in National Defense." (Mr. Frommelt's paper, presented later at a Dec. 11 meeting, is digested on p. 43.)

Actually presented was "The Inside Story of Oil," a sound film released by Socony-Vacuum Oil Co. This film was scheduled for the December meeting of the Section to accompany a paper by G. C. Hazard. As it was too late to contact Mr. Hazard the film was shown and R. G. Boatman of the local Socony-Vacuum Oil Co., led the extremely successful discussion period.

While covering many of the well-known operations of oil as a lubricant, the film also clearly showed aspects of lubrication which even the experienced technician has heretofore been obliged to attempt to visualize by sheer logic.

As an added treat, Harold Hartz, who is in charge of a section of the educational department of the GMC Allison Division, introduced two of the group of R.A.F. technicians now studying Allison engine production, operation and maintenance at first hand. They were Flying Sergeant T. McAndrews and Sergeant S. S. Payne, and each had pertinent questions to enliven the discussion.

Other discussers were: H. L. Knudsen, Cummins Engine Co.; Lee Oldfield, Merz Engineering Co.; H. M. Jacklin and Charles W. Phelps, Purdue University; and R. Lyle

National Aero Meeting to New York

The 1942 SAE National Aeronautic Meeting will be held in New York City, March 12-13. The site has been changed from Washington to avoid the congestion in hotel space at the Capital. The meeting will be held at the Hotel New Yorker.

New Vehicle Weight Laws Discussed by California Group

▪ *So. California*

AT the Nov. 14 T&M meeting of the Southern California Section, held in the Elks Club, Los Angeles, Stewart Mitchell, senior bridge engineer, Division of Highways, State of California, discussed California's new gross vehicle weight provisions. During the course of his talk, Mr. Mitchell detailed the axle arrangements and gross loads permissible with the various arrangements.

Robert N. Reinhard, Los Angeles Auto. Works, Inc., and Golden State Co., Ltd., gave a paper on "Maintenance of Large Fleets." Mr. Reinhard emphasized picking and training of personnel as the most important factor of a maintenance program, and stressed the value of having mechanics attend meetings of societies such as the SAE, where pertinent problems are discussed. He also pointed out the necessity of having adequate facilities to carry out an all-important "preventative maintenance" program, and gave a brief description of his own service inspection operations.

Capt. Roy Galyen of the State Highway Patrol, suggested redesign of highways to increase truck safety. He interspersed his talk with descriptions of accidents and near-accidents which he and his men had witnessed.

Young Discusses German Way Of Lubricating Cold Engines

▪ *Pittsburgh*

A DINNER attendance of 130, with a meeting attendance of 520, proved Pittsburgh's interest in the talk given by Raymond W. Young, Wright Aeronautical Corp., on the Mercedes-Benz airplane engine at a joint meeting of the Pittsburgh Section and the Pittsburgh Aero Club, at the Mellon Institute, Nov. 25. During the day, the German engine was on display in the lobby of the Institute, where it was inspected by hundreds of people, including many ROTC students from the University of Pittsburgh and the Carnegie Institute of Technology.

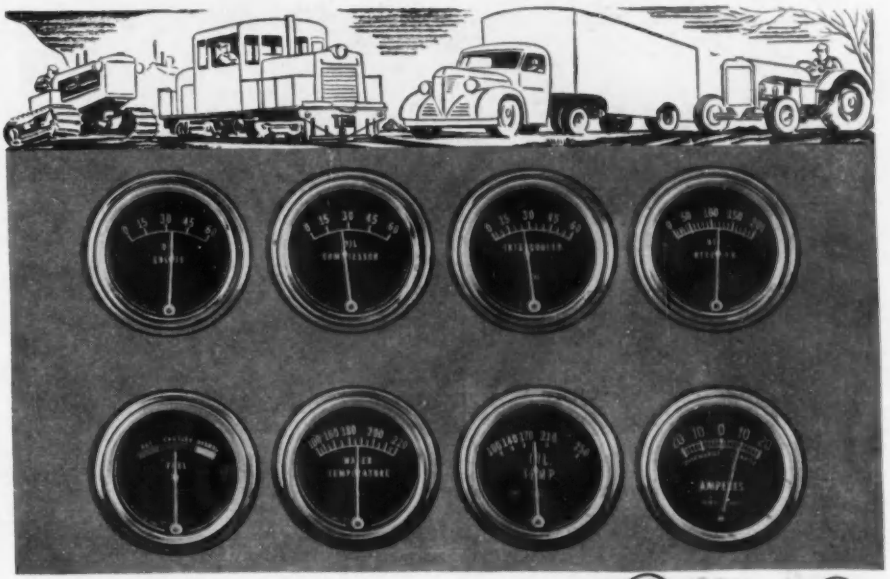
The lively discussion period following the paper was conducted by Clifford Ball, pioneer pilot and president of the Pittsburgh Aero Club.

Of particular interest to members from Western Pennsylvania were Mr. Young's remarks concerning factors of design for "lubrication of cold engines." It was brought out that the design of the Mercedes-Benz engine seems planned for military necessity to eliminate preliminary warm-ups, so that the engine starts promptly, the plane begins rolling, and the rest of the engine warm-up takes place while the plane is gaining altitude.

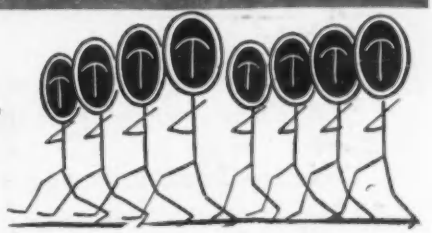
Mr. Young explained this as follows: During this warm-up period in climb, the airplane installation provides a separate tank for fuel mixed with a small portion of oil until the normal operating temperature of the lubricating oil has been attained. At this point, the pilot switches the fuel valve to draw from the main supply system. The generous use of ball bearings in the rear section and the application of roller bearings to the connecting rods as well as large oil passages and grooves throughout the engine all indicate consideration of the special cold lubrication requirements of the engine, Mr. Young said.

Other points brought out by discussers were the relative advantages of fuel injection versus carburetion. In this connection, Mr. Young pointed out that the fuel-air ratio control on the modern aircraft carburetors developed in this country provided somewhat closer limits of operation for varying conditions of altitude, output, and rpm than those indicated by the German fuel-injection system.

He said the universal use of fuel injection on German aircraft engines has been reported



FORWARD for DEFENSE!



WE HERE AT ROCHESTER are proud to be listed among the legion of manufacturers whose services and products have been enlisted in the defense of our great country. Our contribution, though small in comparison to others is, nevertheless, important to the ultimate efficiency of the materiel which is making our forces the best equipped in the world!

Rochester Gauges are being used in many types of war materiel such as: Electrical Transformers and Switch Gear equipment; Diesel and Gasoline Engines for Air Compressors; Generator Sets, Crawler Tractors and Cranes; Oil Gauges for Hydraulically operated Turrets, etc.

SUB-CONTRACT WORK

Inquiries are earnestly invited. A facilities survey complete with photographic illustrations of operation will gladly be sent upon request.

OUR ENGINEERING DEPARTMENT will be glad to submit proposals and layouts *promptly* and *accurately* on any instrument problems pertaining to the functioning of Liquid-Level, Pressure or Temperature. Write today.

ROCHESTER MFG. CO., INC.
21 Rockwood St., Rochester, N. Y.

ROCHESTER *Individually Calibrated* GUARANTEED ACCURATE **INSTRUMENTS**

FOR ACCURATE LIQUID LEVEL, PRESSURE AND TEMPERATURE INDICATION

to be the result of: (1) the high degree of development of diesel pumps by Bosch and a licensing agreement with the Solex Co. of France, whereby Bosch fuel-injection units were utilized on French diesel engines and Solex carburetors were widely used on German automotive engines; (2) the possibility of the depreciation of the quality of fuel available in Germany with the resultant necessity of operating military aircraft on low octane fuel. The German development of synthetic fuel and their access to new sources of supply have, however, produced military aircraft fuel retported to be 92 CFR octane rating, Mr. Young concluded.

Among those who participated in the discussion were W. Coyle Cochrane, Cities Service Oil Co., T. H. Kinkade, Gulf Oil Corp., and R. J. S. Pigott, Gulf Research and Development Co.

Aircraft Engineering

FOUNDED 1929

The Technical and Scientific Aeronautical Monthly

Edited by
Lt.-Col. W. Lockwood Marsh, M.S.A.E., F.R.Ae.S., F.I.Ae.S.

Single Copies: 50 cents post free

Ordinary Subscription: $5.25 per annum, post free

During the War, a special feature is being made of reproductions and translations from the Foreign Technical Press.

BUNHILL PUBLICATIONS LIMITED
12 Bloomsbury Square
London . . . W.C.1
ENGLAND

Waukesha Motor Plant Visited by Wisconsin Group

▪ *U. of Wisconsin*

MEMBERS of the SAE Student Branch of the University of Wisconsin made a trip to Waukesha, Wis., Friday, Nov. 7, where they inspected the plant of the Waukesha Motor Co., and then went on to attend a meeting of the Milwaukee Section of the Society. This trip constituted the regular monthly meeting of the group.

After completing the tour of the plant, the thirty members of the Student Branch were driven to the Milwaukee Athletic Club where they had dinner with the Milwaukee Section. After dinner the students attended the regular meeting of the Milwaukee group, and heard an illustrated talk by C. G. A. Rosen, chief engineer, Caterpillar Tractor Co., who spoke on trends and problems of diesel-engine design. (A report of Mr. Rosen's talk will be found on p. 23.)

Explains Allison Engine Production Flexibility

▪ *So. California*

The flexibility in production and installation of current Allison engines stems chiefly from the complete separation of the engine into three units: the power section, the accessory drive section, and the propeller drive section. R. M. Hazen, vice president and chief engineer, Allison Division, General Motors Corp., explained this statement, which keynoted his talk before the Nov. 28 meeting of the Southern California Section, by saying that such an arrangement was essential because of the frequent changes required by airplane designers in both of the two latter sections.

Five hundred SAE members and guests participated in the meeting held at the Hollywood Athletic Club, Los Angeles. Mr. Hazen's paper was entitled: "The Design and Production Features of the Allison Engine."

Stressing interchangeability of engine model parts as a key to high production, Mr. Hazen said interchangeability between the power sections on the Allison V-1710 and the V-3420 models is so extensive that, with the exception of the upper and lower crankcase and oil pan and a handful of small parts, every part can be used in either model, without modification. This has the double advantage of requiring only a small additional tool investment for the large engine and making available immediately any improved power ratings which can be more rapidly developed on the smaller unit, he said.

"The introduction of more powerful models without interrupting the rise of the production curve," Mr. Hazen said, in referring to the recent developments, "was only obtained by a very cooperative attitude on the part of our production people and the government. As improved parts necessary for the higher powers are tested thoroughly and proved satisfactory, they are, as soon as possible, fed into the production line for all model engines until practically all necessary improvements for the new rating have been incorporated in the older or lower-powered models. When model tests are completed, it then involves only such minor change as a blower ratio and perhaps a new carburetor setting to complete the change-over to the higher-output model. This not only simplifies the production effort by distributing change-over problems and troubles, but also gives the engine user an increasing factor of safety on his current products."

Stating that Allison's main objective is to provide a "power unit and means of cooling which may be readily disposed in the aircraft by the airplane designer to give the optimum performance to the particular features he desires," Mr. Hazen stated that, at the same time, engine design has been carefully coordinated with the view for quantity production and ease of maintenance.

Describing the various features of the Allison engines, the speaker said that flexibility of location of the powerplant may be obtained by suitable use of extension shafting and gearing to give almost any arrangement desired by the airplane designer. Later, discussing liquid-cooled engines in general, and the design advantages accruing from this type of installation, he said, "I have yet to encounter a single case of a reasonably engineered design where liquid-cooled engines have been installed with full regard to both form drag and minimum coolant drag that a gain of at least 7% and usually 10% in top speed has not been achieved. This covers two and four-engine aircraft as well as single-engine units of approximately the same horsepower. There would seem to be no equivalent way of increasing the operating range, increasing top speed, and/or increasing armament carried than by this means of reducing drag."

In answer to a discussion question by C. P. Sanders, chief engineer, Kinner Motors, Inc., on the horsepower dissipated in the coolant in Allison engines, Mr. Hazen said, "The heat rejection is around 400 hp or roughly 40% of the brake horsepower, for the coolant. It all depends on the output. For take-off conditions at high engine speed, I would say it is around 12% of the horse-

New SAE Engine Test Codes Published

The first SAE Aircraft-Engine Test Code and the revised Diesel-Engine Test Code are now available from the Society.

The Aircraft-Engine Code includes the SAE acceptance tests for engines in production, general routine practices in engine testing, with formulas, definitions, descriptions, mechanical information, a log sheet, temperature correction tables, and curve sheets, suitably prepared for use as laboratory test records. The general testing instructions are in the form of a pamphlet, while the forms for recording and logging the tests and the curve sheets are available individually and are suitable for making blueprint copies. The complete set consists of a nine-page pamphlet and ten separate forms, all 8½ x 11 in. except the curve sheets for laboratory records, which are of larger size.

The Diesel-Engine Code consists of one sheet of General Rules, including the horsepower correction formula, two sheets for test mechanical information, a log sheet, and four curve forms – all of the latter are suitable for making blueprint records. The complete set of diesel forms consists of eight sheets, all 8½ x 11 in.

power to the oil. The heat rejection to the coolant is abnormally low for some reason we have not determined."

Mr. Hazen does not feel that liquid-cooled engines offer any more of a target in air combat than does any other type of engine. As the width of the liquid-cooled powerplant is no larger than the width of the pilot and as most air attacks come from the front or rear of the plane, he believes that it is pretty hard to hit the "bull's-eye." Besides, he said, liquid-cooled engines are largely armor-plated.

Discussing relative weights and starting characteristics of the liquid-cooled and air-cooled installations, Mr. Hazen said, "I think until recently there has been some penalty in liquid-cooled installation weights. But, with 1325 hp, our engines will undoubtedly not be any heavier than air-cooled jobs of the same horsepower. We have found little difference in the starting horsepower of liquid-cooled and air-cooled engines."

Sees Material Shortages Boon to Plastic Development

■ *Indiana*

"PRIORITIES and the rationing of metals and other materials seem certain to hasten the day of more general use of plastics as engineering material by the automotive and other industries," H. A. Frommelt, director of industrial research, Kearney & Trecker Corp., told engineers of the Indiana Section, at the Dec. 11 meeting, held in the Hotel Antlers, Indianapolis. He went on to say that all too frequently engineers and industrialists have considered the new synthetic substances as gadget material – kitchen gadgets at that.

The very fact that plastics will be forced into use wherever adaptable to take the place of restricted materials in civilian production, Mr. Frommelt said, will give them a better chance to show their merits. Certainly, if they prove good enough for war use, he continued, the makers of goods for domestic employment when they again are free to go into full production will find new outlets for these materials.

The paper began with a history of the discovery and early employment of plastics; proceeded with a series of charts and graphs showing the composition of the principal types and varieties of the substitute substances; and was concluded with a full description of some of the machine tools employed in making molds for the manufacture of plastics.

Praises Metallurgists For Quality of '42 Cars

■ *Syracuse*

CAR owners can thank metallurgists of the automotive and allied industries for the fact that the 1942 cars will continue to uphold the tradition of fine quality and long life inherent in American motor vehicles, Joseph Geschelin told members and guests of the joint meeting of the Syracuse Section and the Technology Club of Syracuse, Nov. 24. The Detroit technical editor of Chilton Co. said replacing of structural materials comprised the major activity of builders of passenger cars in preparation for the new model year, and that many of the mechanical changes and much of the change in manufacturing procedures resulted from just such necessity.

C. F. B. Roth, chairman of the Syracuse Section, introduced the speaker to the Onondaga Hotel audience, and presided during the discussion period following the talk.

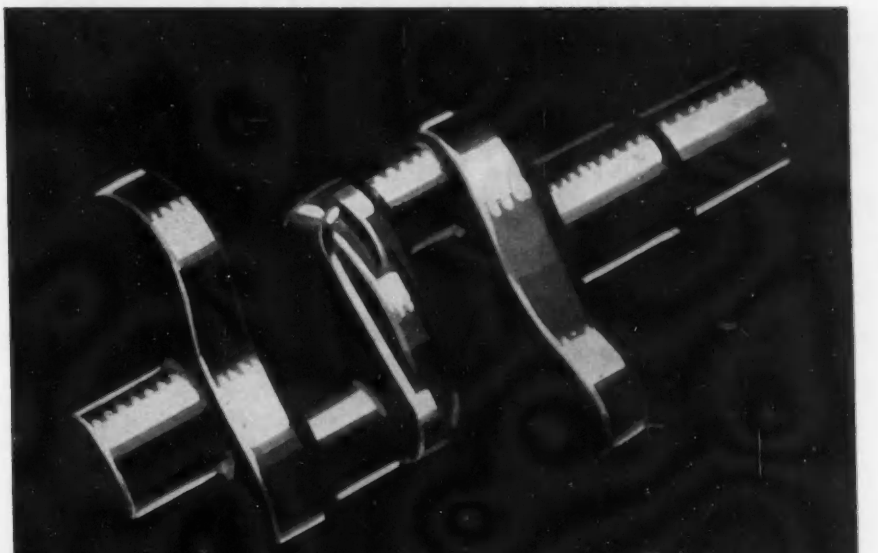
Cites Bearing Needs Of Rebuilt Engines

■ *Philadelphia*

THE necessity for installing bearings of higher load-carrying capacity when rebuilding engines was stressed by A. B. Willi, Federal-Mogul Corp., in his talk "Bearings for Heavy-Duty Automotive Engines," at the Dec. 10 meeting of the Philadelphia Section.

The engineering audience was told that when an engine is rebuilt and the crankshaft journals reground, undersize bearings must be used. These are supplied with standard thickness of the steel backing with as much as 0.090 in. babbitt lining which is bored out to fit the shaft. This thicker lining, Mr. Willi said, has inherently a lower load-carrying capacity than the original thin babbitt, but in addition to this, the rebuilt engine will stress the bearings worse than originally because of misalignment due to bent crankshaft and connecting rods or warped crankcase, or because of improper clearances or dirt carelessly picked up.

A digest of Mr. Willi's paper was carried in the December SAE Journal (p. 37) and the complete paper is scheduled to appear in the Transactions Section of the February issue.



It has been the privilege of Wyman-Gordon to participate in the engineering and manufacturing development of aviation, all along the way. Since the dawn of aviation, Wyman-Gordon forgings have been factors in the accomplishment of the reliability of air travel.

Today, with every forging laboratory controlled, Wyman-Gordon is producing crankshafts, cams, propellers and other vital parts, night and day, at full speed.

WYMAN-GORDON

WORCESTER, MASS.
HARVEY, ILL. DETROIT, MICH.

SAE Coming Events

Jan. 12-16 — SAE Annual Meeting (and Engineering Display)
Book-Cadillac Hotel – Detroit, Mich.

March 12-13 — SAE National Aeronautic Meeting
Hotel New Yorker – New York City

May 31 – June 5 — SAE Semi-Annual Meeting
The Greenbrier – White Sulphur Springs, West Va.

Baltimore – Jan. 8

Engineers Club; dinner 6:30 p.m. Lubrication and Its Problems – R. J. S. Pigott, staff engineer, Gulf Research & Development Co.

Buffalo – Jan. 8

Joint meeting with Engineering Foundation of Buffalo. The Artificial Creation of Speech.

Chicago – No meeting

Cleveland – Jan. 12

Cleveland Club; dinner 6:30 p.m. Development of the Allison Aircraft Engine – Ronald M. Hazen, vice president, chief engineer, Allison Division, General Motors Corp.

Indiana – No meeting

Metropolitan – Jan. 22

Park Central Hotel; dinner 6:30 p.m. Automotive Equipment in War Service – A. W. Herrington, president, Marmon-Herrington Co., Inc. Synthetic Rubber in War Applications – K. D. Smith, technical superintendent, Tire Division, B. F. Goodrich Co. Building of Tanks for Defense – Robert Biggers, president, Fargo Division, Chrysler Corp.

Milwaukee – Jan. 9

Milwaukee Athletic Club; dinner 6:30 p.m.

New England – Jan. 8

Engineers Club, Boston, Mass.; dinner 6:30 p.m. Synthetic Rubbers – I. E. Lightbown, Stanco Distributors.

Northern California – Jan. 13

San Francisco. Subject to be announced.

Northwest – Jan. 8

Tacoma, Washington. Dinner 7:00 p.m. Subject: Army Equipment and Civilian Defense.

Oregon – Jan. 9

Benson Hotel, Portland; dinner 6:45 p.m. Subject: Tractor – Z. C. R. Hansen, retail sales manager, International Harvester Co.

Pittsburgh – Jan. 27

Webster Hall; dinner 6:30 p.m. Meeting 8:00 p.m. Mellon Institute. New Developments in Diesel Engines – C. G. A. Rosen, assistant chief engineer in charge of diesel research, Caterpillar Tractor Co.

Southern California – Jan. 16 and 30

Jan. 16. Elks Club, Los Angeles. Passenger Car meeting.

Jan. 30. San Diego; meeting place to be announced. Subject: Aircraft.

Tulsa Group – Jan. 9

Oklahoma City. Hydraulic Transmissions for Commercial Vehicles – P. E. Biggar, executive engineer, General Motors Truck & Coach Division, Yellow Truck & Coach Mfg. Co.

Washington – Jan. 13

Lee Sheraton Hotel; dinner 6:30 p.m. Conservation and Substitution of Defense Materials – E. J. Hergenroether, consultant, Conservation and Substitution Branch, Bureau of Industrial Conservation, Office of Production Management.

SAE Standard Procedure Recommended for Testing Hardenability of Steel

(*Concluded from p. 20*)

W. E. Jominy – "Hardenability Tests" – Symposium on Hardenability of Alloy Steels – ASM, 1939.

M. A. Grossmann, M. Asimow, and S. F. Urban – "Hardenability, Its Relation to Quenching and Some Quantitative Data" – Symposium on Hardenability of Alloy Steels – ASM, 1939.

B. R. Queneau and W. H. Mayo – "Hardenability and Its Designation, the Hardenability Line" – Symposium on Hardenability of Alloy Steels – ASM, 1939.

■

1940

Gordon T. Williams – "Hardenability Variations in Alloy Steels – Some Investigations with the End Quench Test" – Transactions, ASM, Vol. 28, 1940, pp. 157-181.

M. Asimow and M. A. Grossmann – "Hardening Characteristics of Various Shapes" – Transactions, ASM, Vol. 28, 1940, pp. 949-977.

W. E. Jominy – "Commercial Aspects of Hardenability Tests" – *Metal Progress,* Nov. 1940, pp. 685-690.

A. L. Boegehold, W. H. Graves, and E. W. Upham – "Selection and Application of Automotive Steels" – Symposium on New Materials in Transportation, ASTM, Publication – March 6, 1940, p. 31.

■

1941

W. E. Jominy – "Hardenability Tests – Correlation Each to Each" – *Metal Progress;* April, 1941, pp. 447-451.

A. L. Boegehold – "Use of Hardenability Tests for Selection and Application of Automotive Steels" – SAE Transactions, July 1941, pp. 266-276.

F. E. McCleary and R. Wuerfel – "Determining Hardenability on Small Sizes" – SAE Transactions, July 1941, pp. 276-278.

O. V. Greene and C. B. Post – "Determination of Specific Hardenability of Shallow-Hardening Steels" – SAE Transactions, July 1941, pp. 278-283.

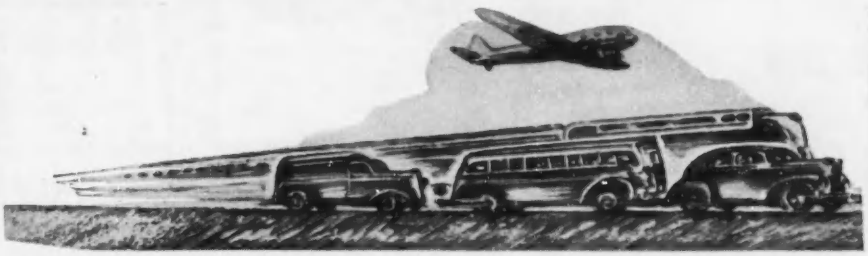
M. Asimow, W. F. Craig, and M. A. Grossmann – "Correlation Between Jominy Test and Quenched Round Bars" – SAE Transactions, July 1941, pp. 283-293.

R. C. Trerichs and E. S. Rowland – "Hardenability Testing of Low Carbon Steels" – ASM Preprint No. 16, 1941.

C. B. Post, O. V. Greene, and W. H. Fenstermacher – "Hardenability of Shallow-Hardening Steels" – ASM Preprint No. 17, 1941.

SAE JOURNAL *Pre-Prints*

THE SOCIETY OF AUTOMOTIVE ENGINEERS, INC.
29 W. 39TH ST., NEW YORK



News of the **MARCH** *Issue*

How To Buy Earth-Moving Truck Tires

WITH tire rationing now an actuality, American operators of essential trucking units must exercise supreme care in selecting and buying tires to get maximum service out of each precious pound of rubber.

In the field of earth-moving trucks – now used in plant excavation work, fortification building, and all the manifold construction tasks of war defense – it's especially necessary that the greatest possible wear be extracted from each heavy-duty tire.

Not only are these tires expensive, containing an appreciable amount of rubber per unit, but, if they prove misfits, the entire shoe often must be discarded.

The sudden tire-rationing development is one compelling reason why the forthcoming March SAE Journal article by Walter Lee, Goodyear expert, on the subject of fitting the earth-moving tire to the job, should be of particular interest to fleet operators.

(*Concluded on page* 10, *column* 2)

AIRCRAFT SUPERCHARGER DRIVES OF ALLIES AND NAZIS COMPARED

PLANE TALK

. . . . The April SAE Journal will report the . . . .

SAE NATIONAL AERONAUTIC MEETING

MARCH 12-13 NEW YORK

Long Haul – *These huge earth-moving truck trailers typify a vast army of such vehicles engaged in war construction work. Tires have to take it in this business . . . and they must be selected with utmost care now that tire rationing has become an actuality*

AERIAL combat is going higher and higher as World War II progresses and, as a result, there is a grim race in aircraft supercharger development under way. One of the burning questions of the moment is: "How do British and American supercharger drives compare with those used by the Germans?"

The penetrating answer will be found in the March SAE Journal.

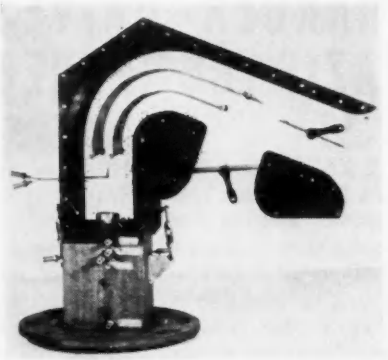
With German planes being constantly knocked out of the sky over England, there has been considerable study of Nazi supercharger techniques. For instance, in examining the German DB 601A engine which has been on tour of this country lately (full story in the October 1941 SAE Journal), engineers found that the Germans were using fluid couplings in their supercharger drives. While this type of drive is used in modern cars, it had not been applied to American aircraft up to that time.

American aircraft engineers, how-

(*Concluded on page* 10, *column* 3)

Airscoop Research Improving Fighter Craft

AN aircraft carburetor depends for its smooth operation on the airscoop – that specially designed part that projects out into the air stream to catch air and direct it to the engine carburetor for proper mixture with the fuel.



Transparent – *This is an airscoop model, one of many designed for research study by Bendix Aviation engineers. The air, sucked in through the opening at the right, is transmitted to the carburetor at the bottom. Pulsations from the airplane propeller add to design problems of modern airscoops*

A simple device – yet if it is not located properly in relation to the engine cowling, if it is too wide, or too deep, or incorrectly throated, the efficiency of the plane engine is materially reduced.

Up to a little while ago, it was difficult to test the effects on air flow of different airscoop designs. That was before ingenious Bendix Aviation engineers devised test airscoops with transparent walls. Into these they direct air streams fogged with kerosene, thus enabling observers actually to see what happens inside an airscoop under flight conditions. This new testing method is revolutionizing airscoop research.

In a March SAE Journal article, F. C. Mock, Bendix Aviation, will say: "Many of our ideas as to the effect of airscoops upon carburetion have been derived from the past, when carburetors were non-automatic, requiring continuous readjustments by the pilot as soon as the airplane left the ground for changes of air pressure."

Author Mock points the way to revision of preconceived notions on airscoop design with the latest available data.

How to Buy Earth-Moving Truck Tires

(*Concluded from page 9*)

Another reason is that Mr. Lee reviews the latest developments in this fast-moving field of tire design.

The first pneumatic tires used on earth-moving equipment were standard truck and bus tires designed for highway service. They soon proved unequal to the task because of insufficient "flotation."

Today, special earth-moving tires are being built for this field but, as Mr. Lee points out, "there are still a great many problems to be solved before this type of tire reaches the plane of satisfaction now enjoyed by the standard highway truck tire."

Thus, in this formative stage, when even the tires are still under development, automotive engineers need just the kind of selection yardstick Walter Lee provides in the March SAE Journal. Read "Selection of Tires for Better Earth-Moving Performance and Economy."

WASHINGTON . . .

is pretty well booked up so far as securing space for a big meeting like the SAE National Aeronautical Meeting, scheduled for March.

So this year this annual technical conclave will be held in the Hotel New Yorker, New York.

Aircraft Supercharger Drives

(*Concluded from page 9*)

ever, have not been caught napping; they have plenty of supercharger drive surprises up their sleeves.

Some of these developments will be reviewed in the March SAE Journal in a fascinating analysis of how they stack up today in comparison with Axis designs. Written by F. M. Kincaid, Jr., Wright Aeronautical Corp. expert, "Two-Speed Supercharger Drives" promises to be a technical eye-opener.

American Panzer – *One of the main auxiliary units of our mechanized force is the half-track scout car. Rubber tracks and front-wheel drive give it remarkable cross-country mobility. Large quantities of these vehicles are in production for the rapidly-expanding mechanized fighting arm of the U. S. Army*

All-Rubber Tracks Open New Tractor Era

A FARMER and his wife go shopping in their big crawler tractor – right through the downtown section of a busy city – as easily and speedily as if they were riding in a modern car.

Incredible?

As a publicity stunt to demonstrate the advances made in crawler tractor operation through the use of all-rubber tracks, a movie company recently made a feature short of a farmer and his wife on just such a shopping tour.

While there is little likelihood of "tractor shopping" becoming common practice, the fact that it can be done is cogent proof that "rubber treads have done for the crawler tractor what rubber tires did for the 'round wheelers'."

Some 10 years ago, The B. F. Goodrich Co. saw the possibilities latent in all-rubber crawler tracks and started development on this then-radically-new laboratory product . . .

Today, because of this development, crawler tractors are speedier, quieter, easier to handle . . . and the U. S. Army has the world's most efficient and versatile tanks and half-track scout cars.

Two of the men who have followed closely this striking engineering venture are Goodrich's Robert Mayne and H. W. Delzell. We are happy to report that the March SAE Journal will carry their own story of the all-rubber track development.

"The 'Square Wheel' Tractor Goes to Town" is the title.